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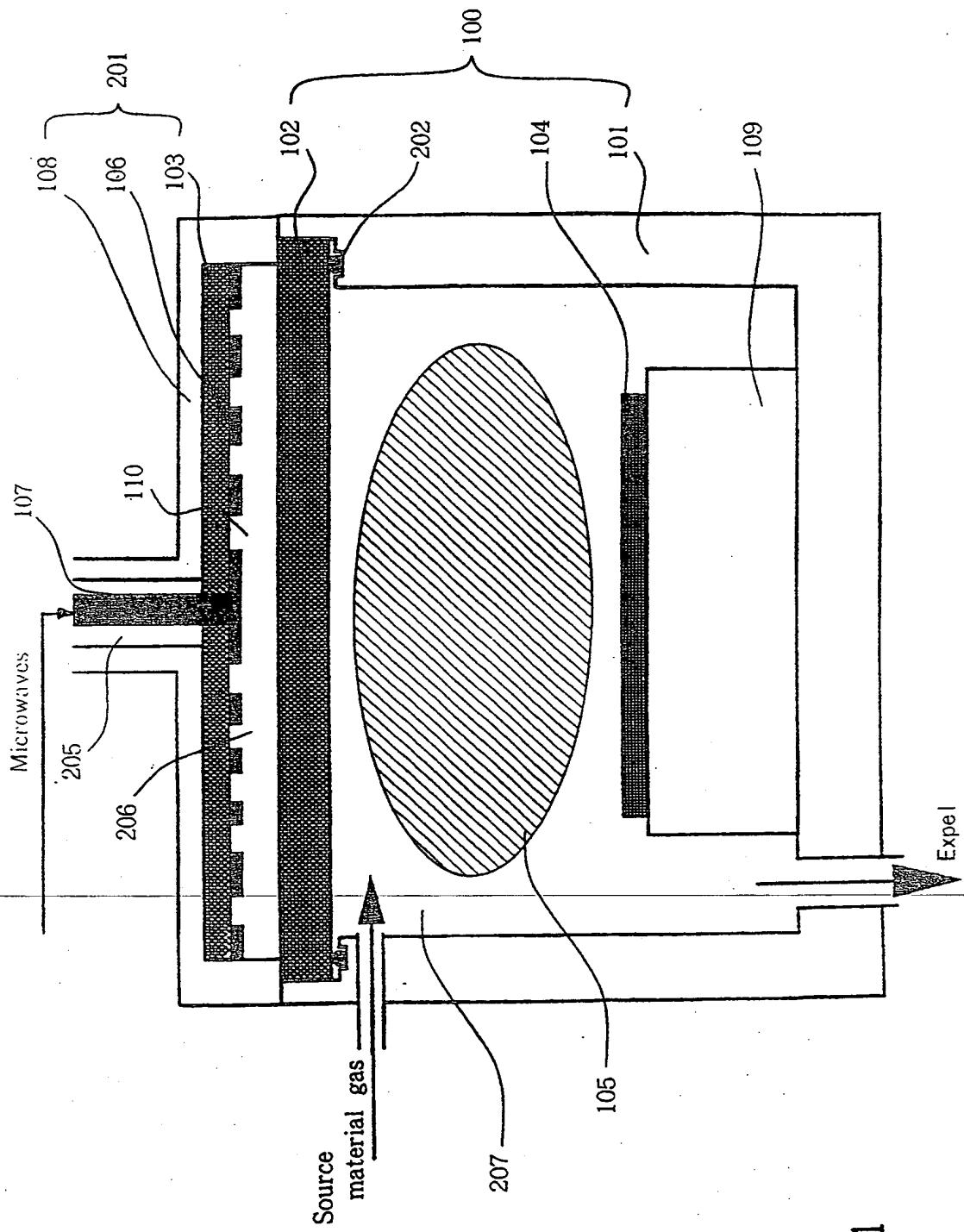
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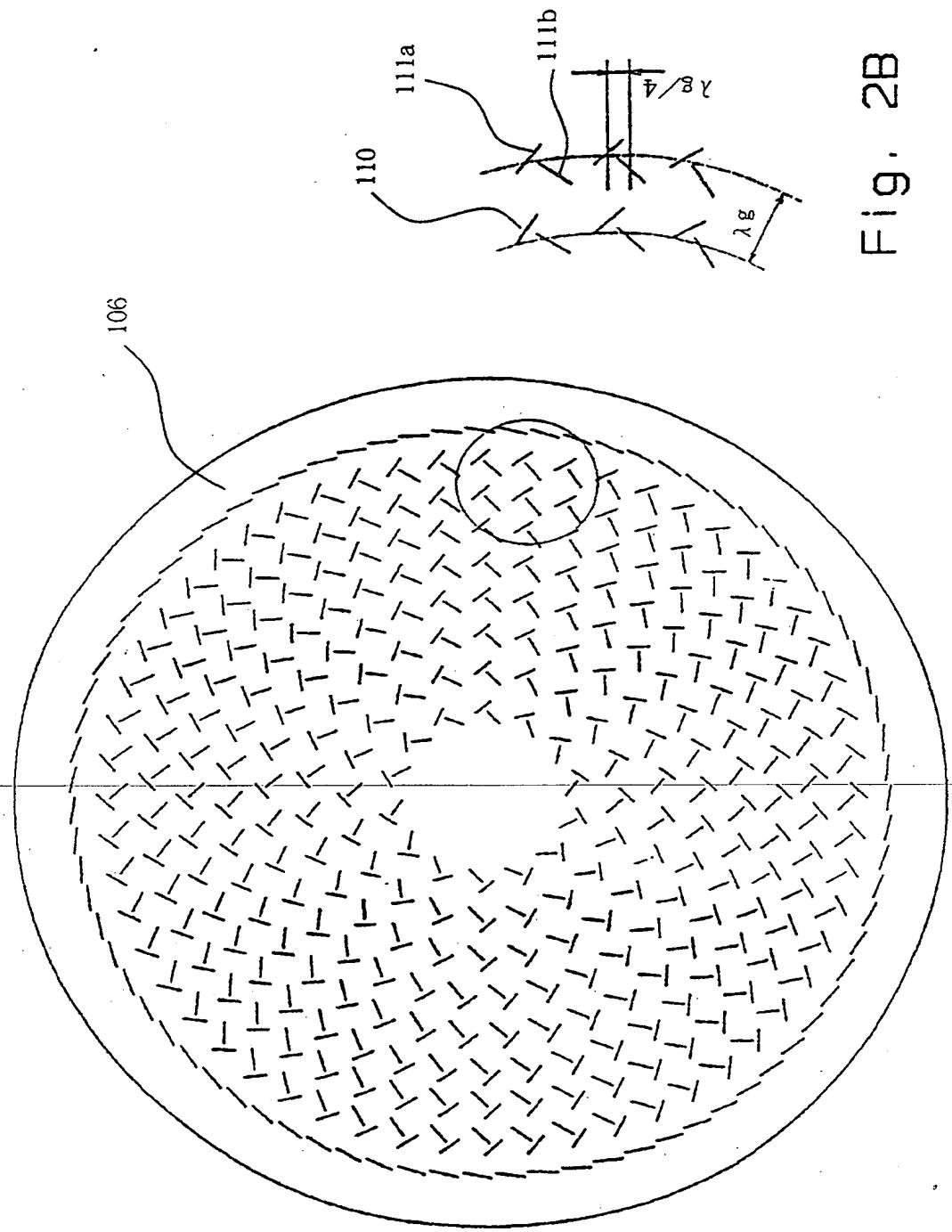


Fig. 2A

Fig. 2B

Microwave power (W)	400	800	1200	1600
Chamber material and inner surface processing				
conductivity ($\Omega^{-1} \cdot \text{m}^{-1}$)				
SUS (no inner surface processing)	1.4×10^6			
Pb (inner surface processing onto SUS)	4.8×10^6	x	x	x
Ta (inner surface processing onto SUS)	8.0×10^6	x	x	x
W (inner surface processing onto SUS)	1.7×10^7	x	o	o
Al (inner surface processing onto SUS)	3.7×10^7	o	o	o
Au (inner surface processing onto SUS)	4.3×10^7	o	o	o
Cu (inner surface processing onto SUS)	6.0×10^7	o	o	o
Ag (inner surface processing onto SUS)	6.3×10^7	o	o	o

Inner surface processing thickness: $10 \mu\text{m}$ ○ plasma stable Δ plasma unstable x no activation of plasma caused

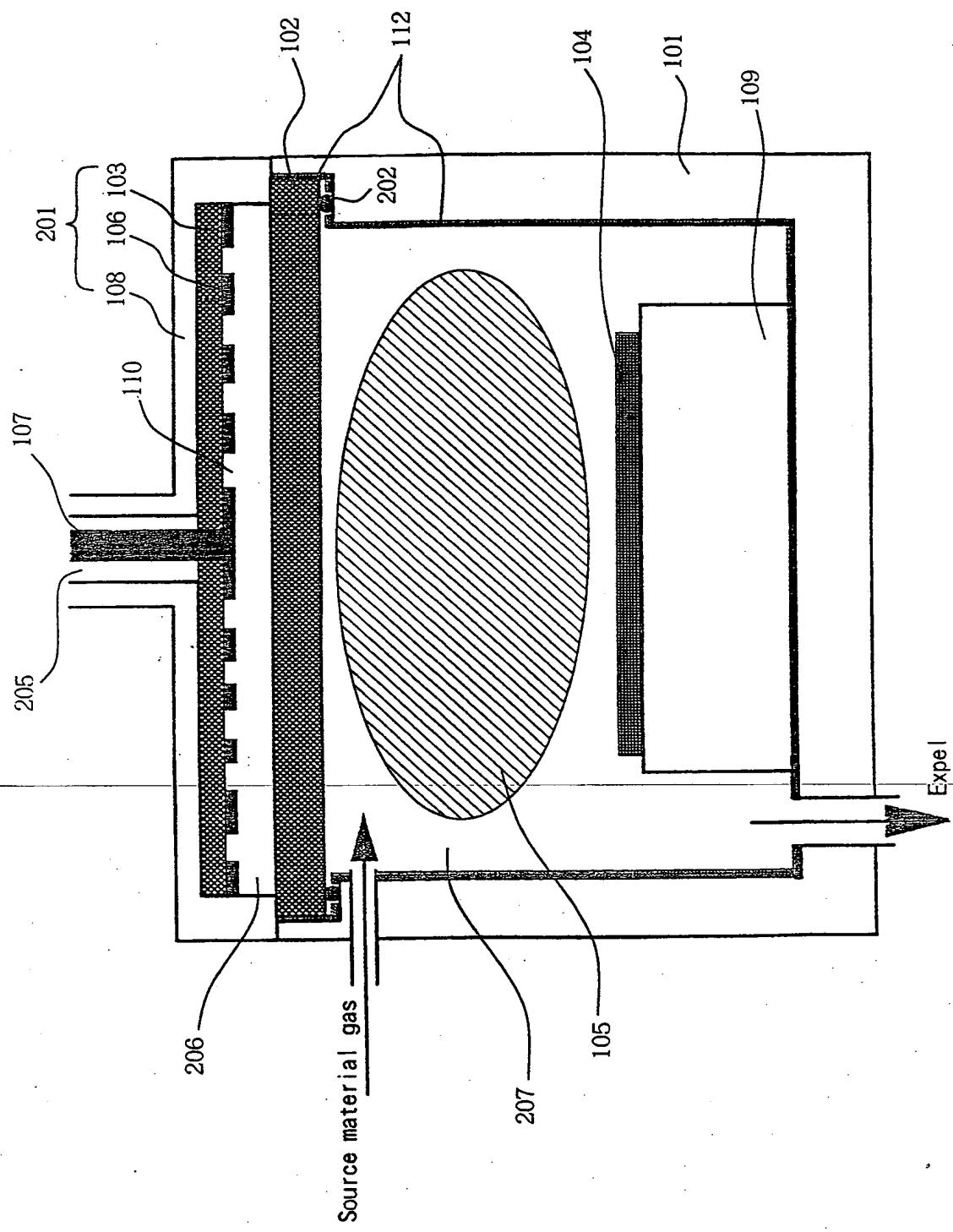
Fig. 3

Al thin film thickness (μm)	10.0	5.0	2.0	1.5	1.0	0.7	0.5	0.2
Plasma generation state caused by frequency of microwaves								
2.45GHz	○	○	○	△	△	×	×	×
8.3GHz	○	○	○	○	○	△	×	×

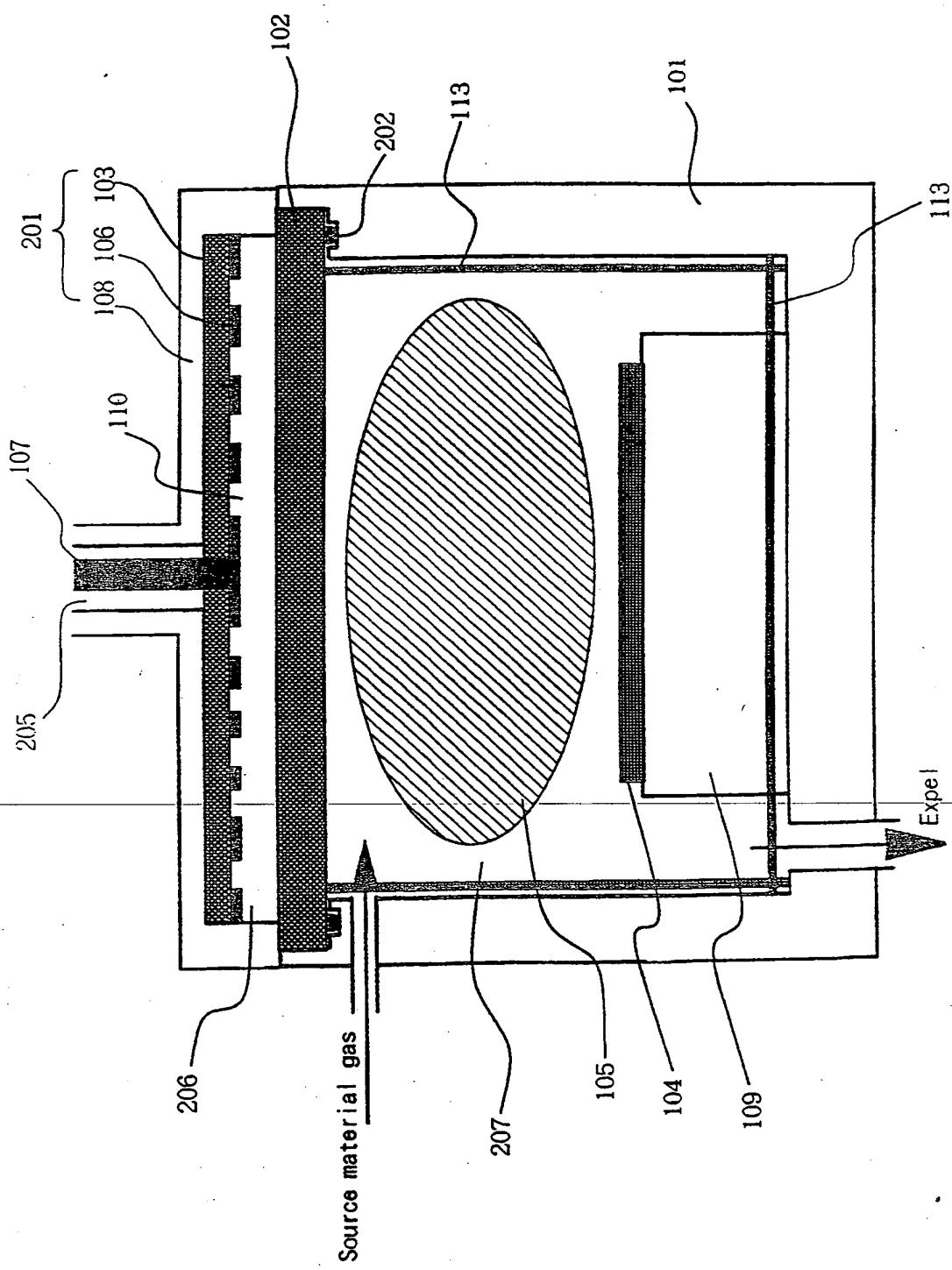
skin depth determined from microwave $\delta = (2/\mu_0 \sigma \omega)^{1/2}$ when microwave frequency is 8.3GHz(0.89 μm)

skin depth determined from microwave $\delta = (2/\mu_0 \sigma \omega)^{1/2}$ when microwave frequency is 2.45GHz(1.67 μm)

Fig. 4



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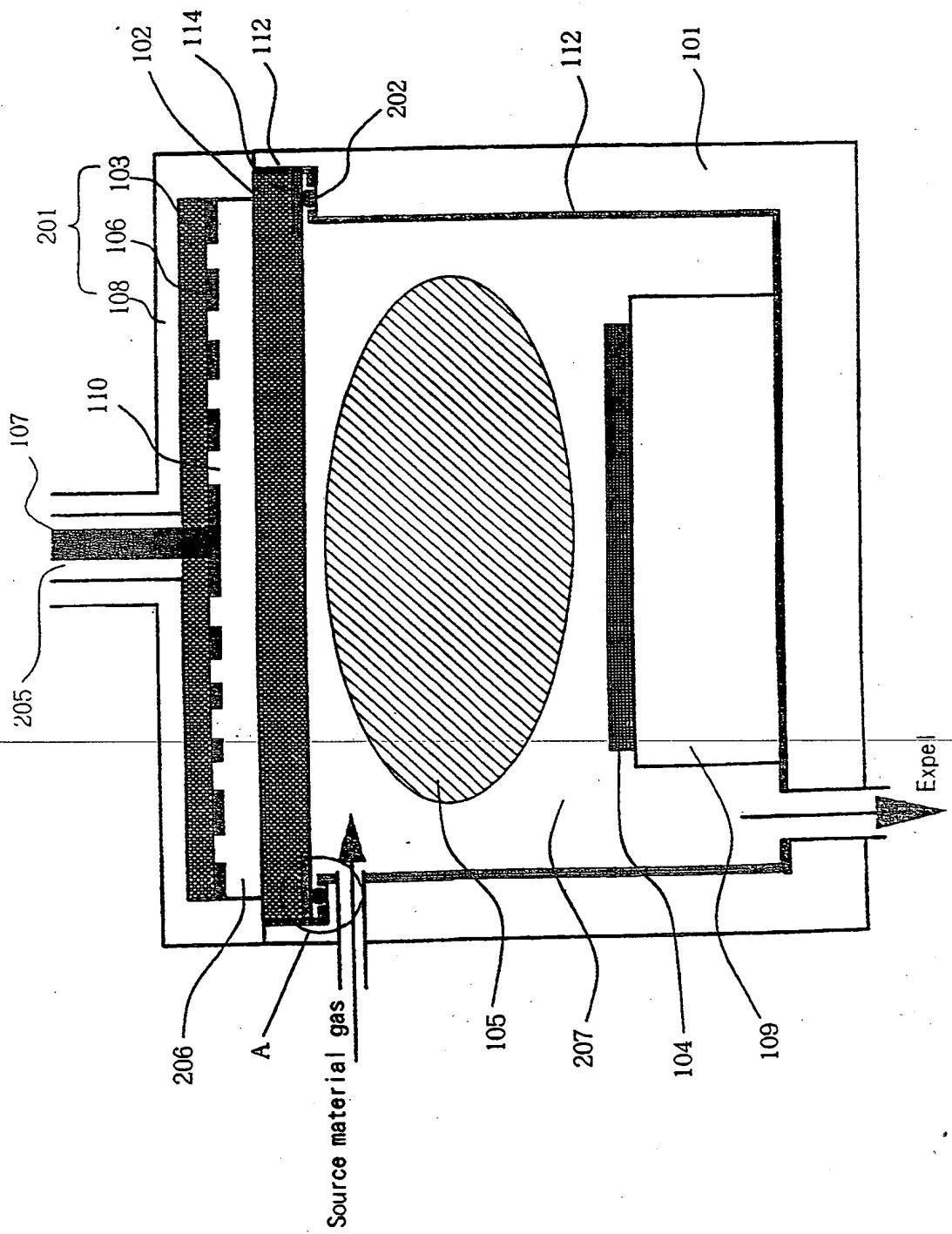


Fig. 7

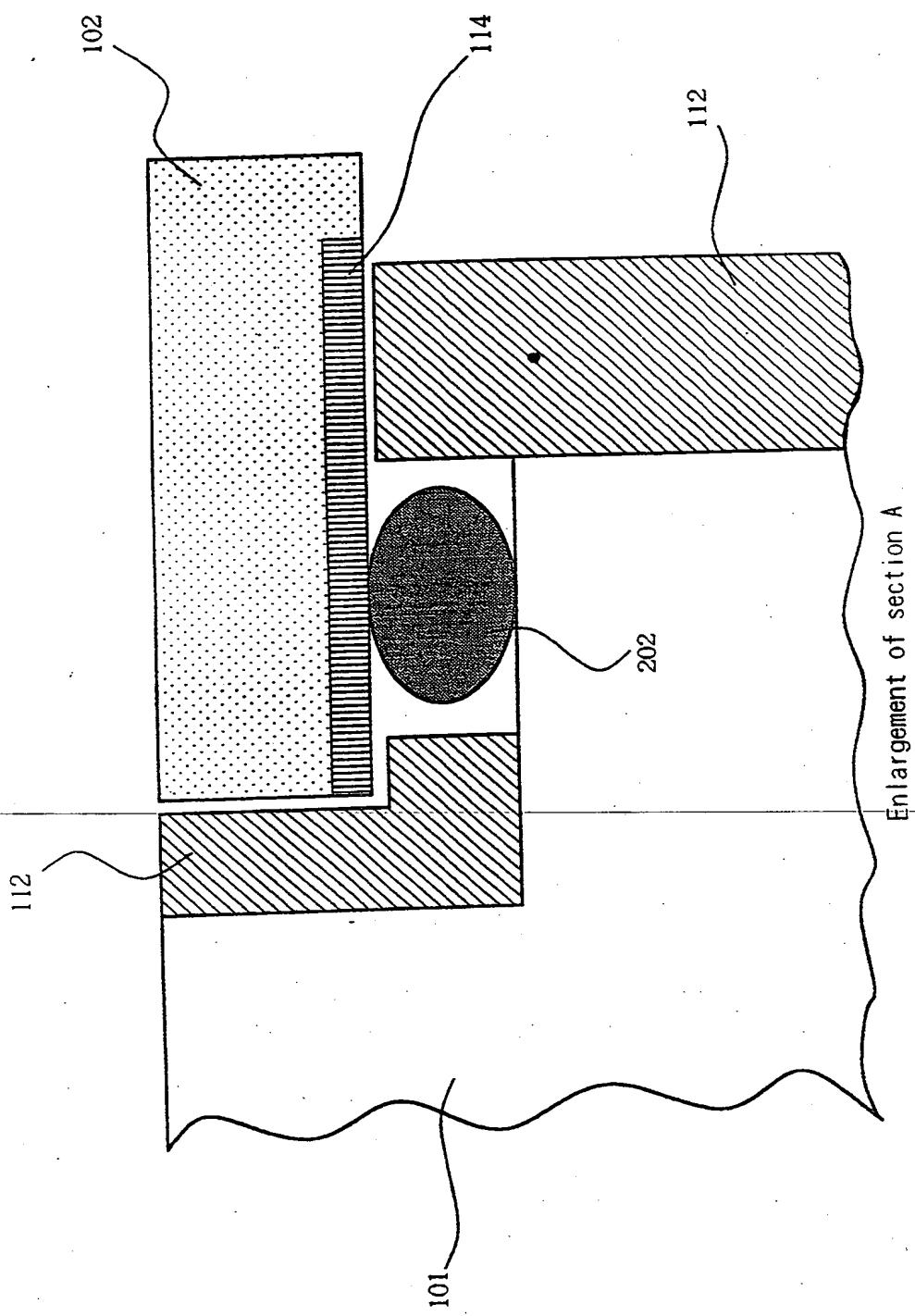


Fig. 8

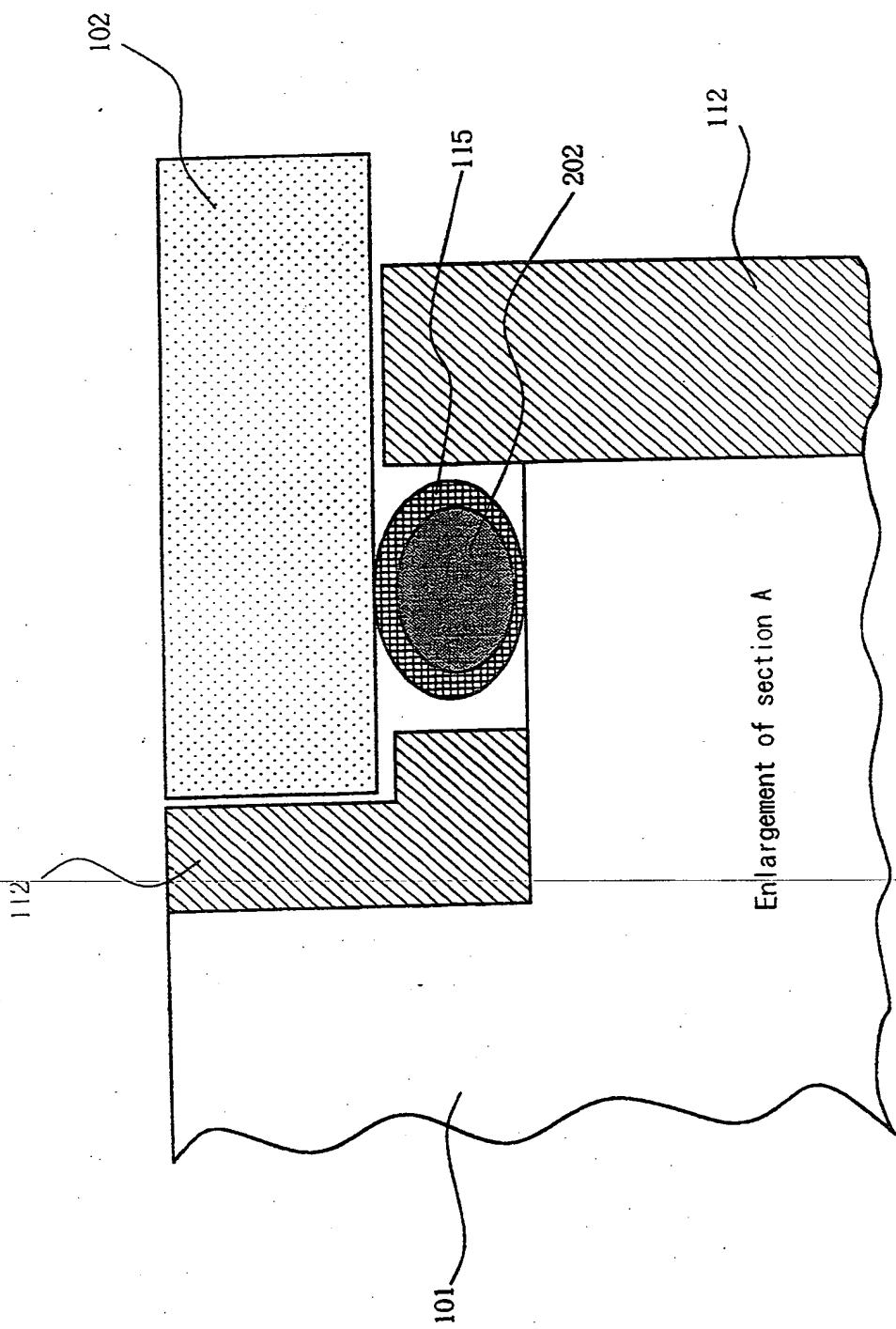


Fig. 9

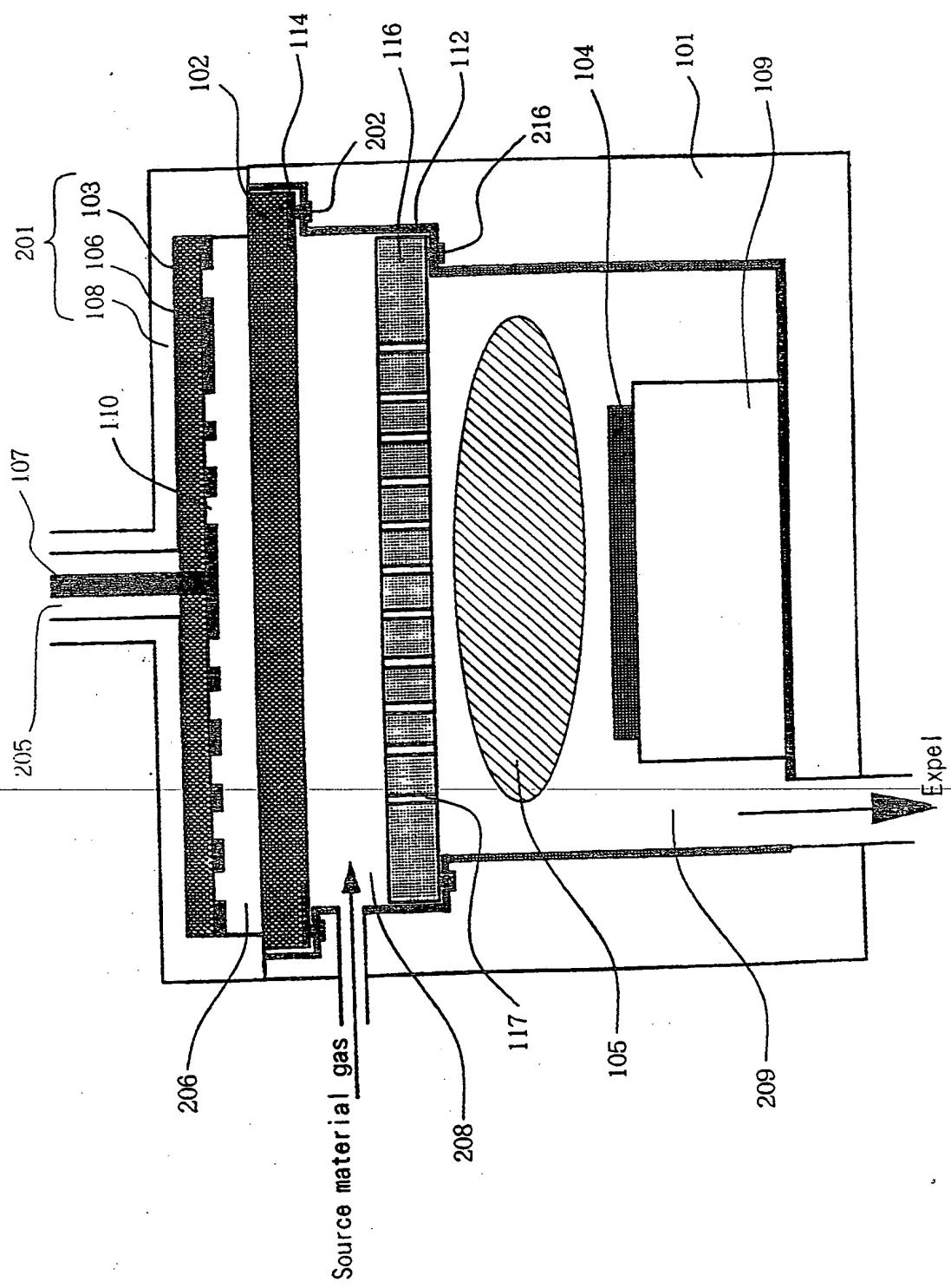


Fig. 10

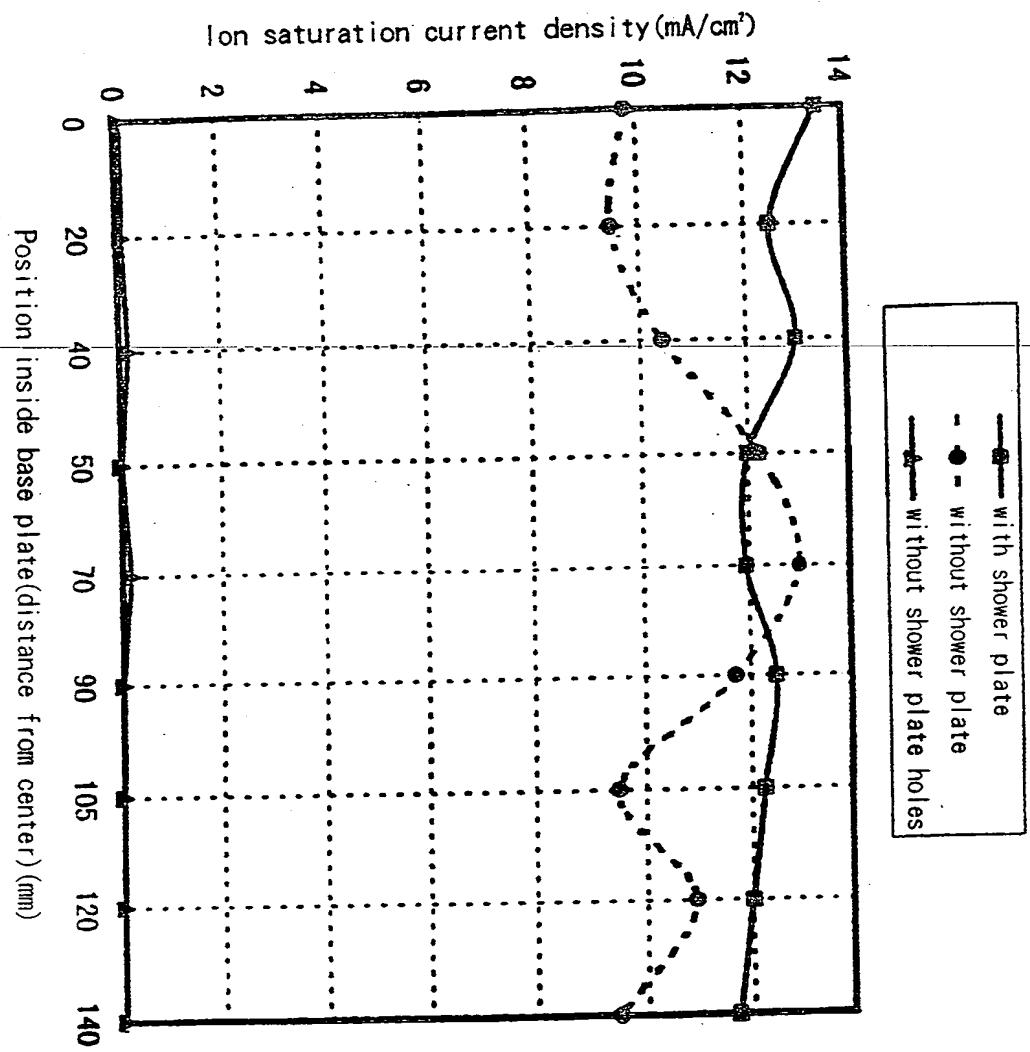


Fig. 11

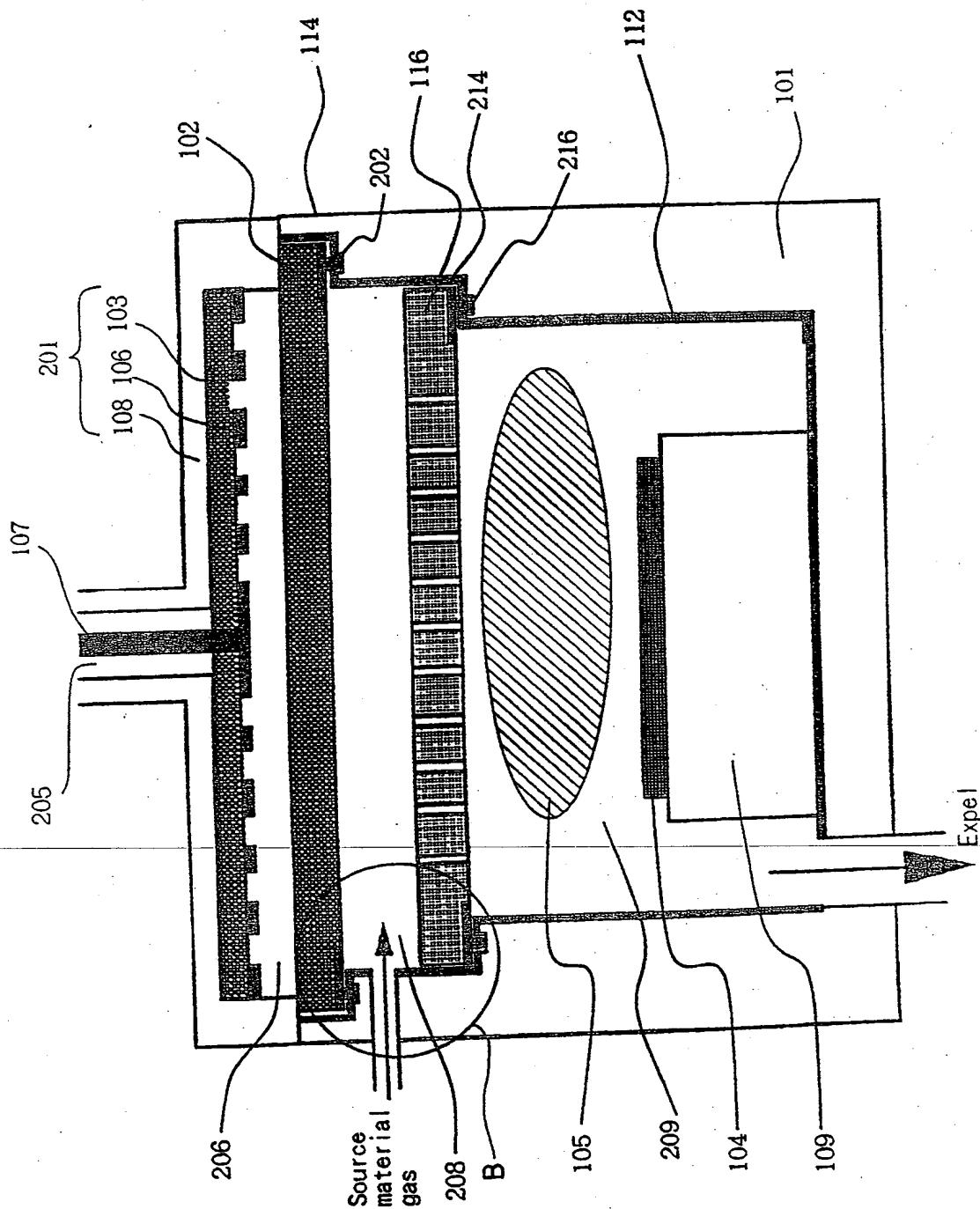


Fig. 12

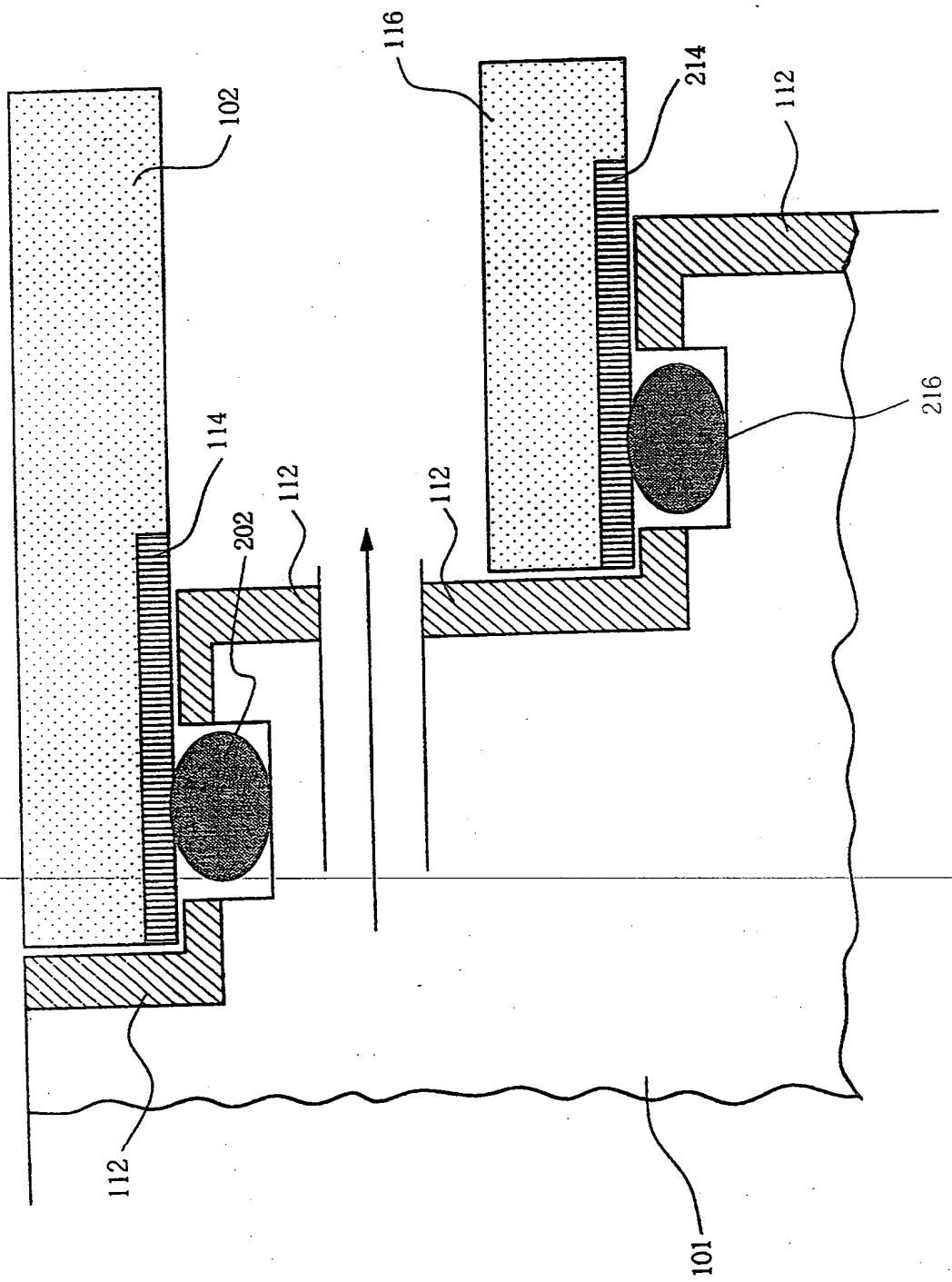


Fig. 13

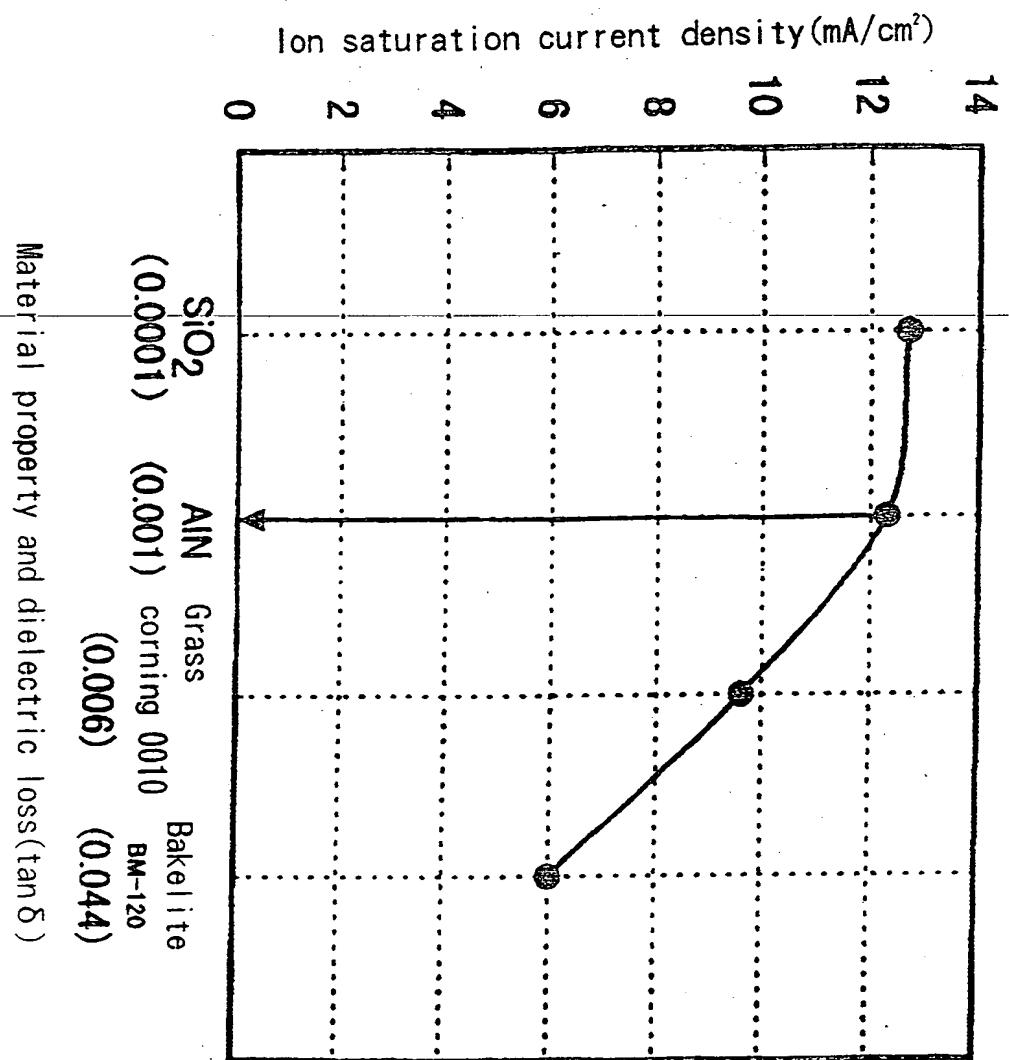


Fig. 14

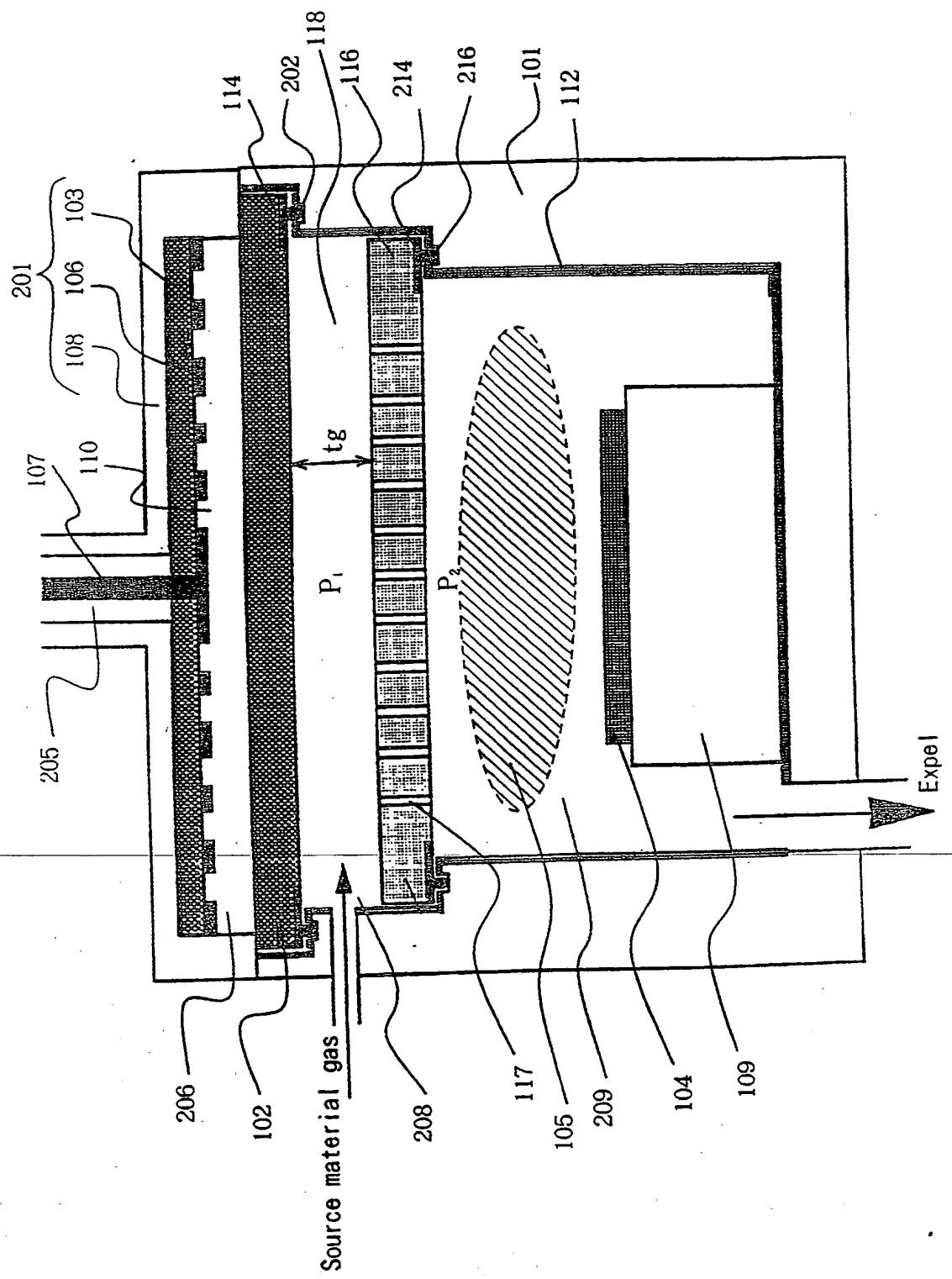


Fig. 15

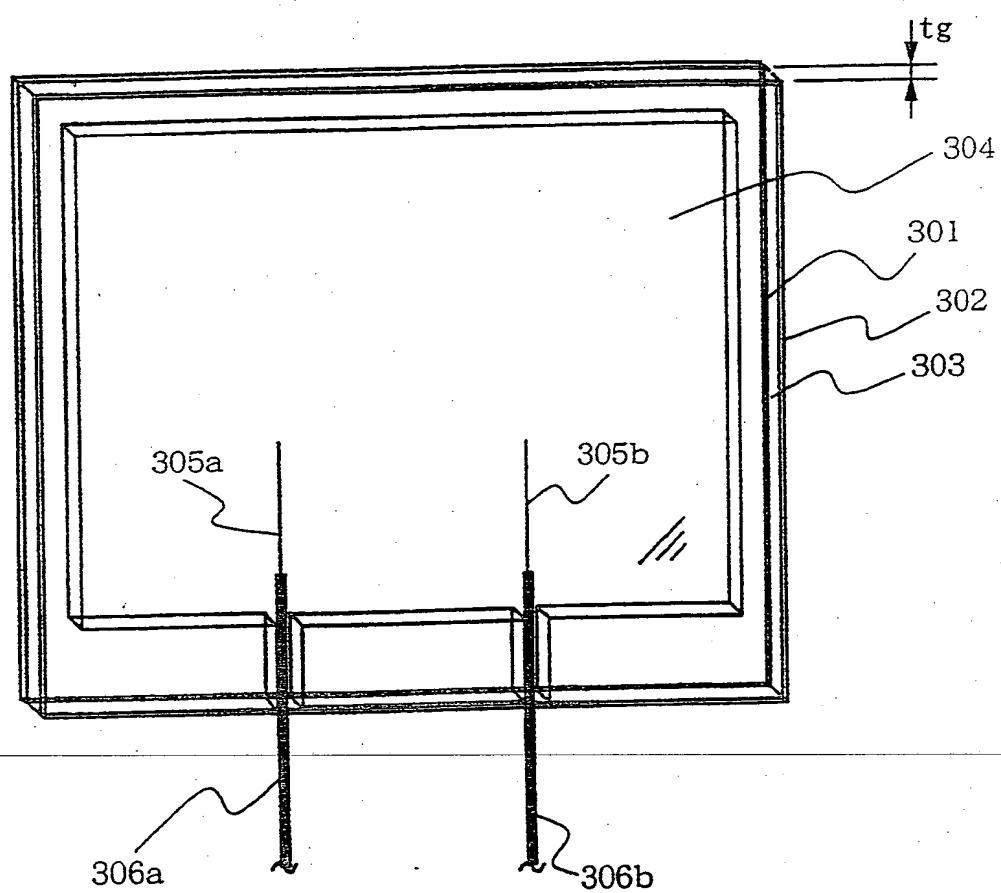


Fig. 16

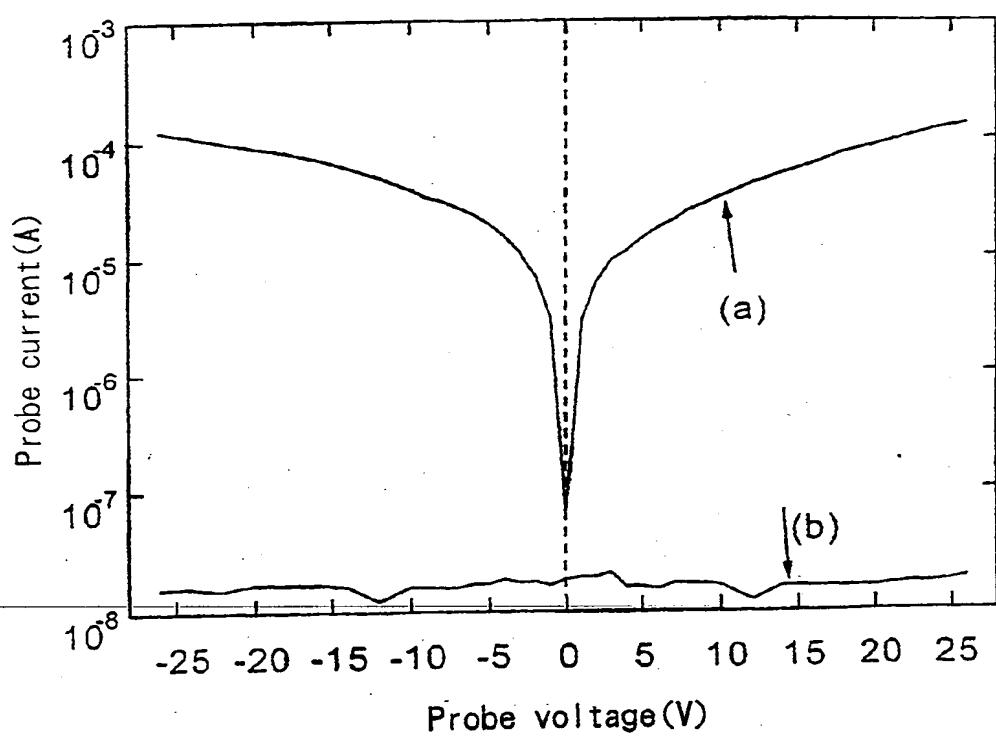
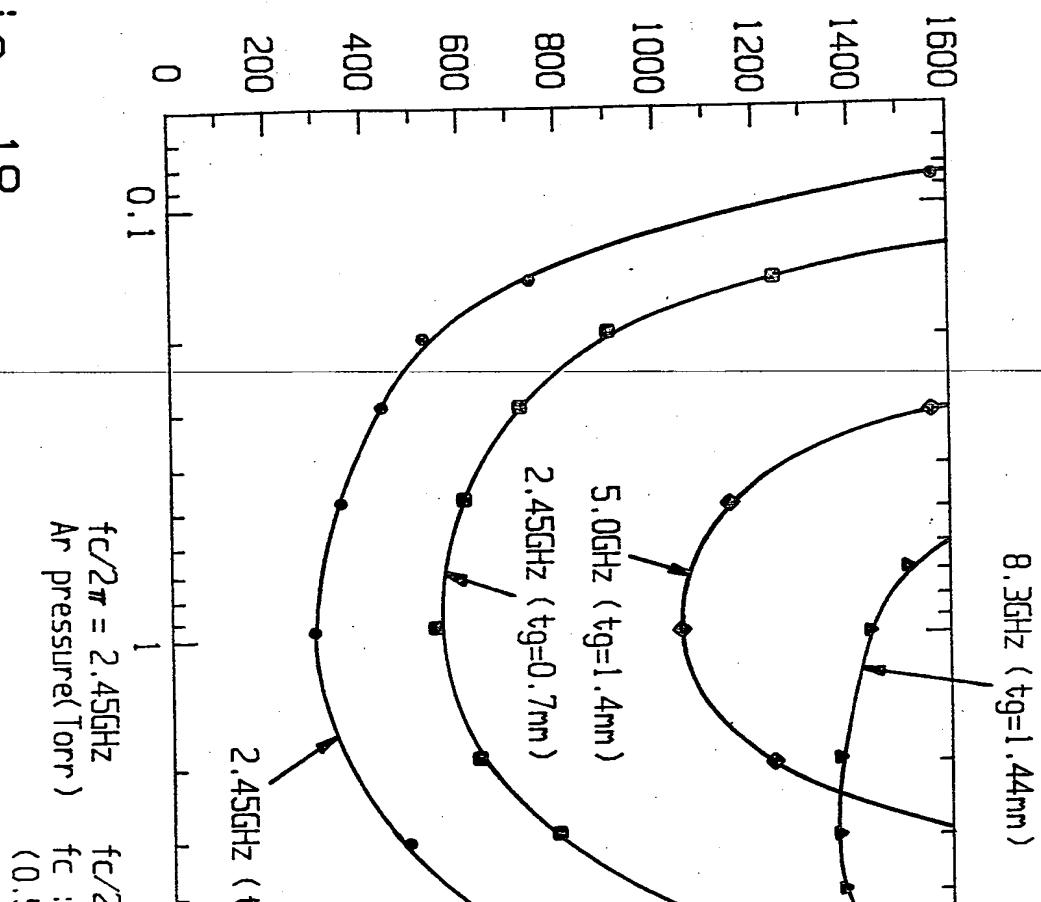


Fig. 17

Minimum discharge power (W)



$f_c/2\pi = 2.45\text{GHz}$ $f_c/2\pi = 8.3\text{GHz}$
 Ar pressure(Torr) f_c : collision frequency
 (0.5eV, Ar)

Fig. 18

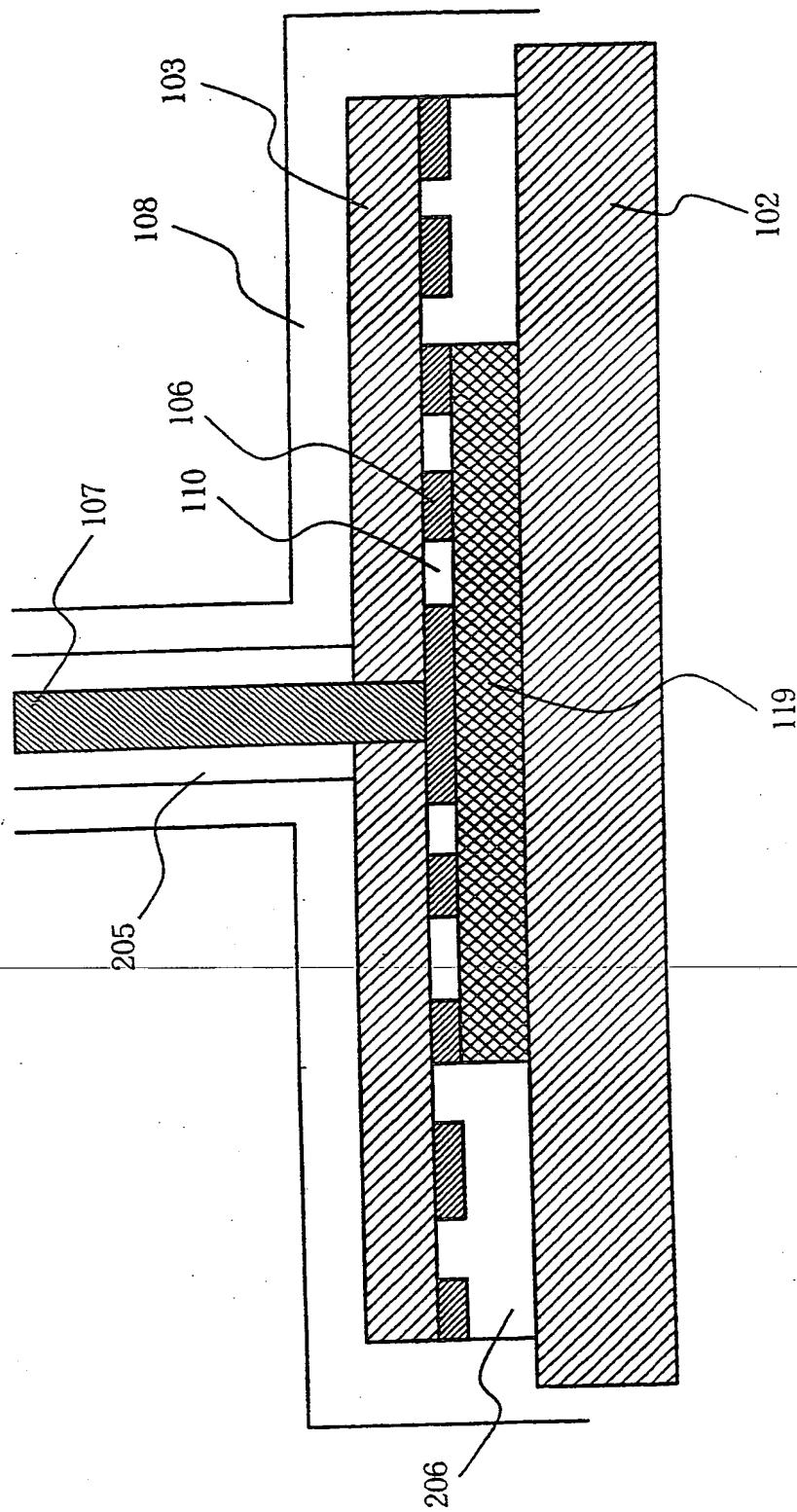


Fig. 19

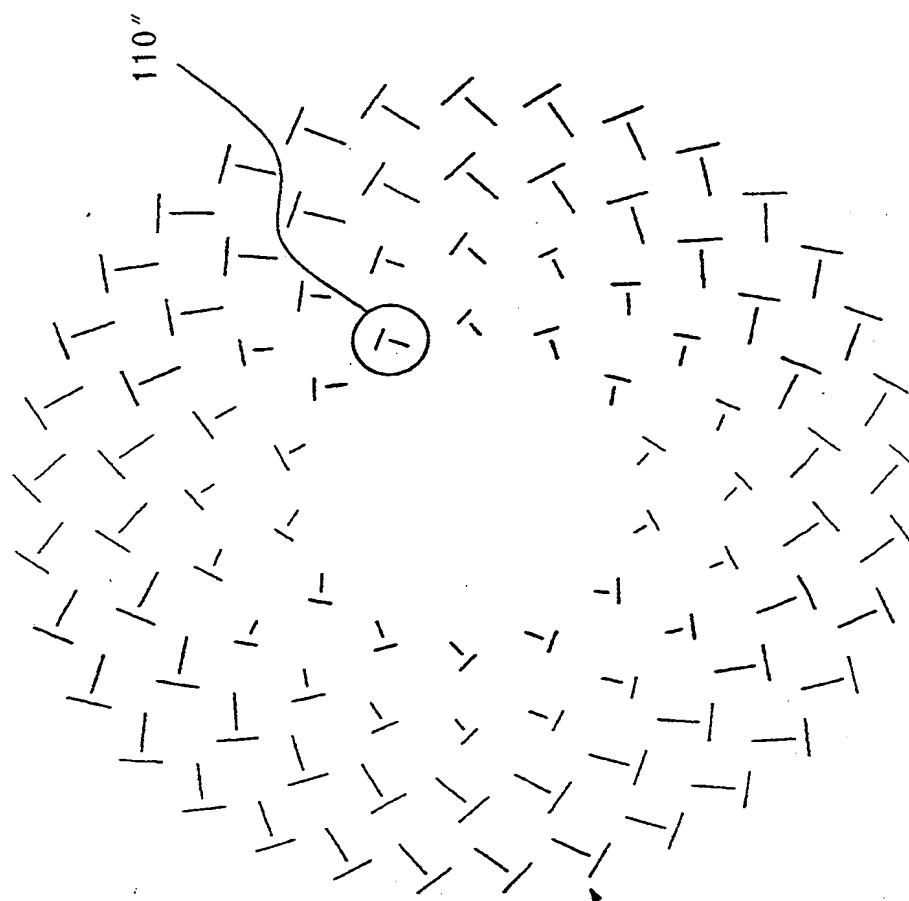


Fig. 20B

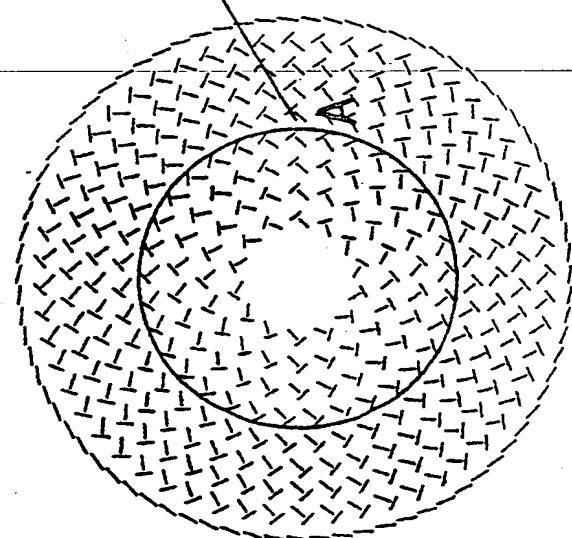


Fig. 20A

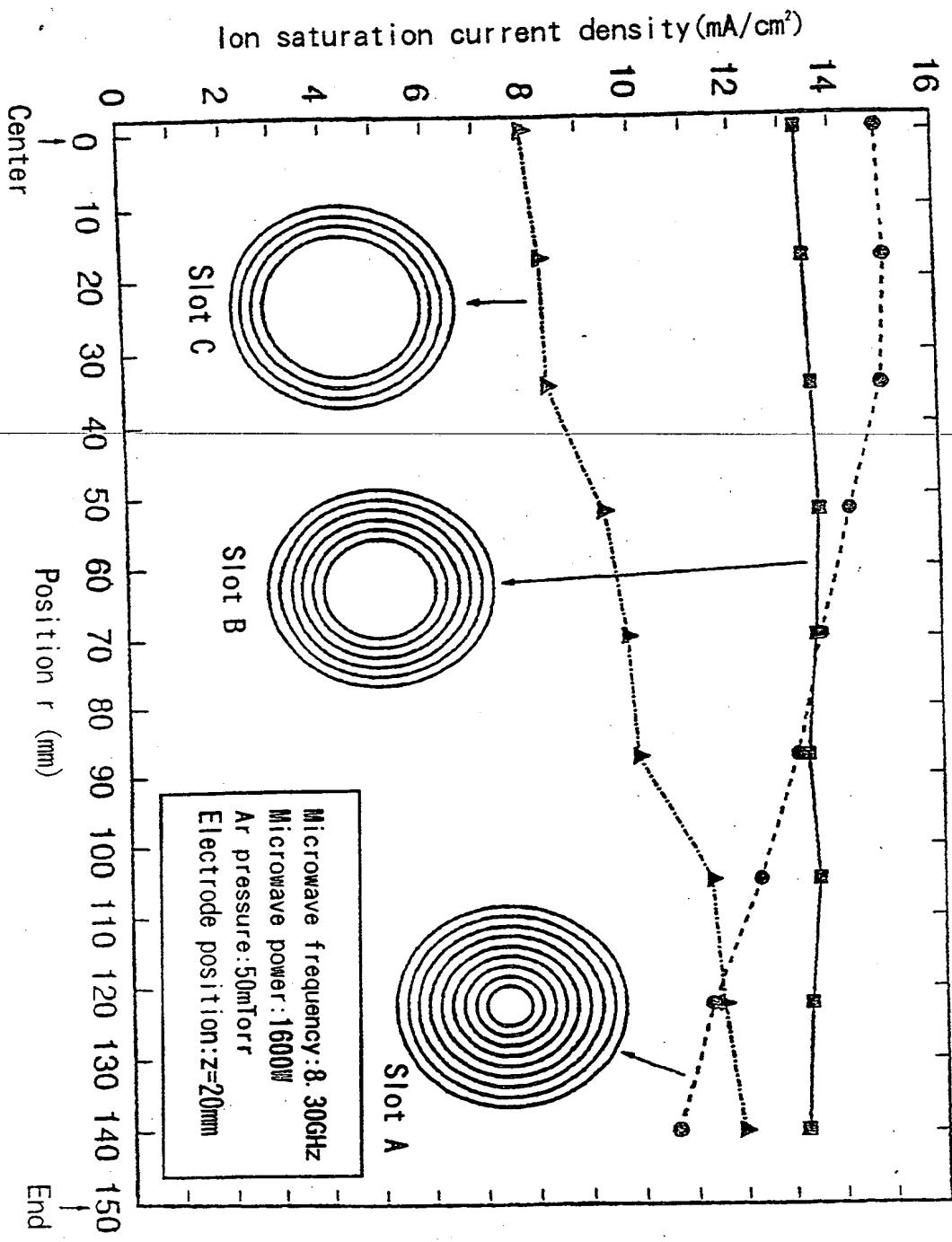


Fig. 21

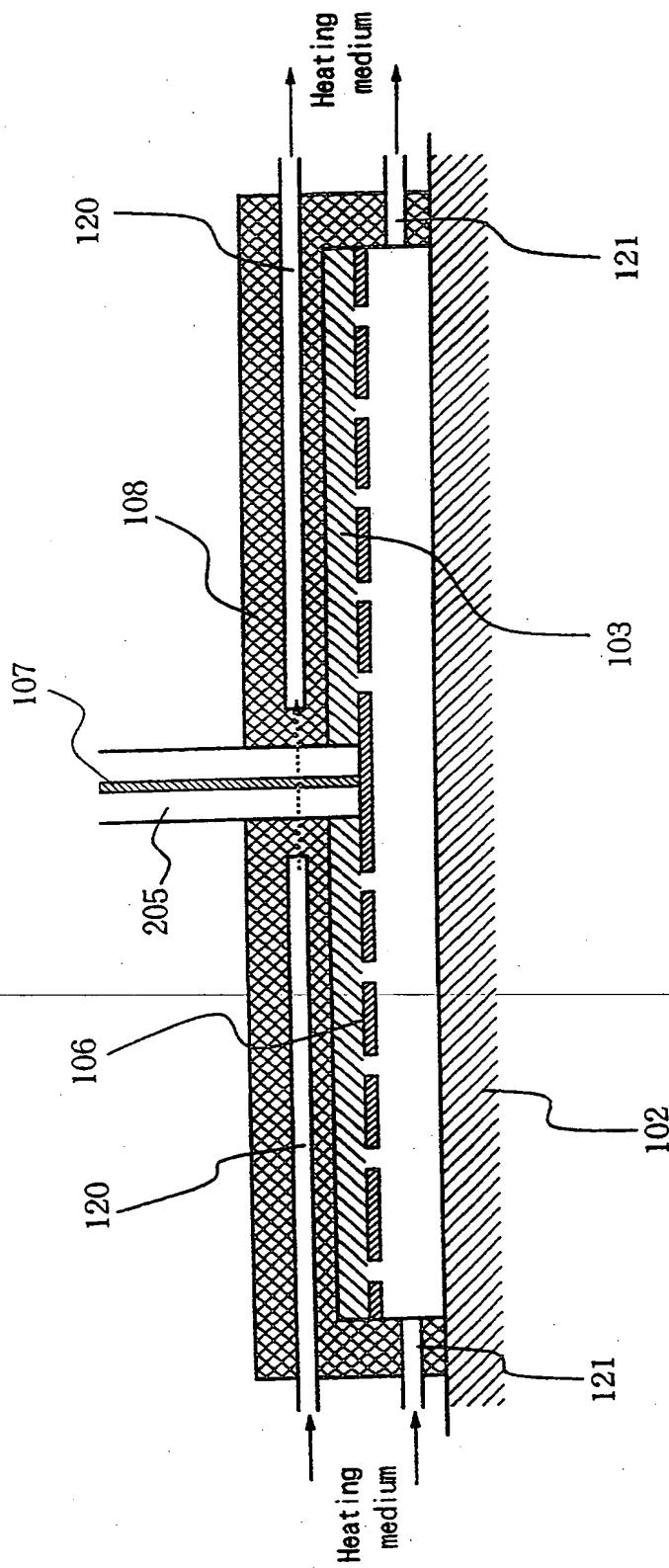


Fig. 22

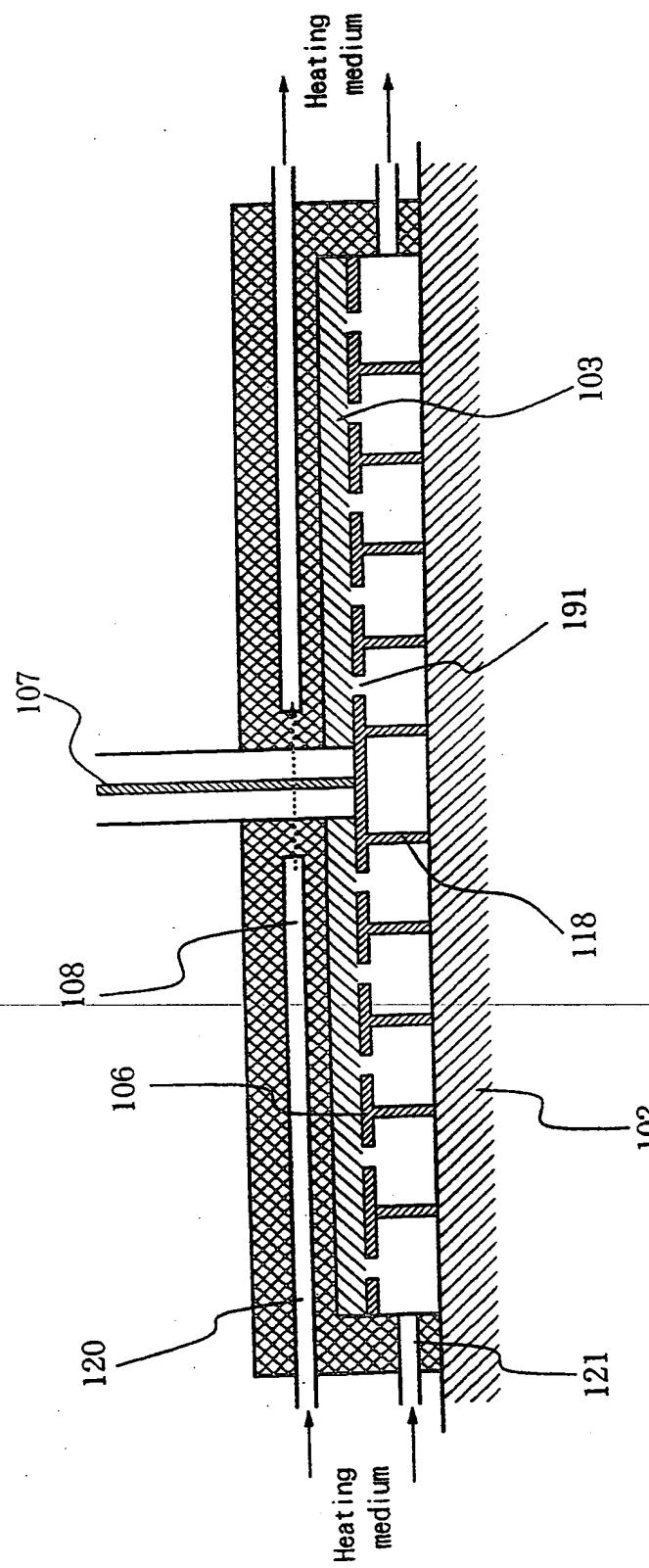


Fig. 23

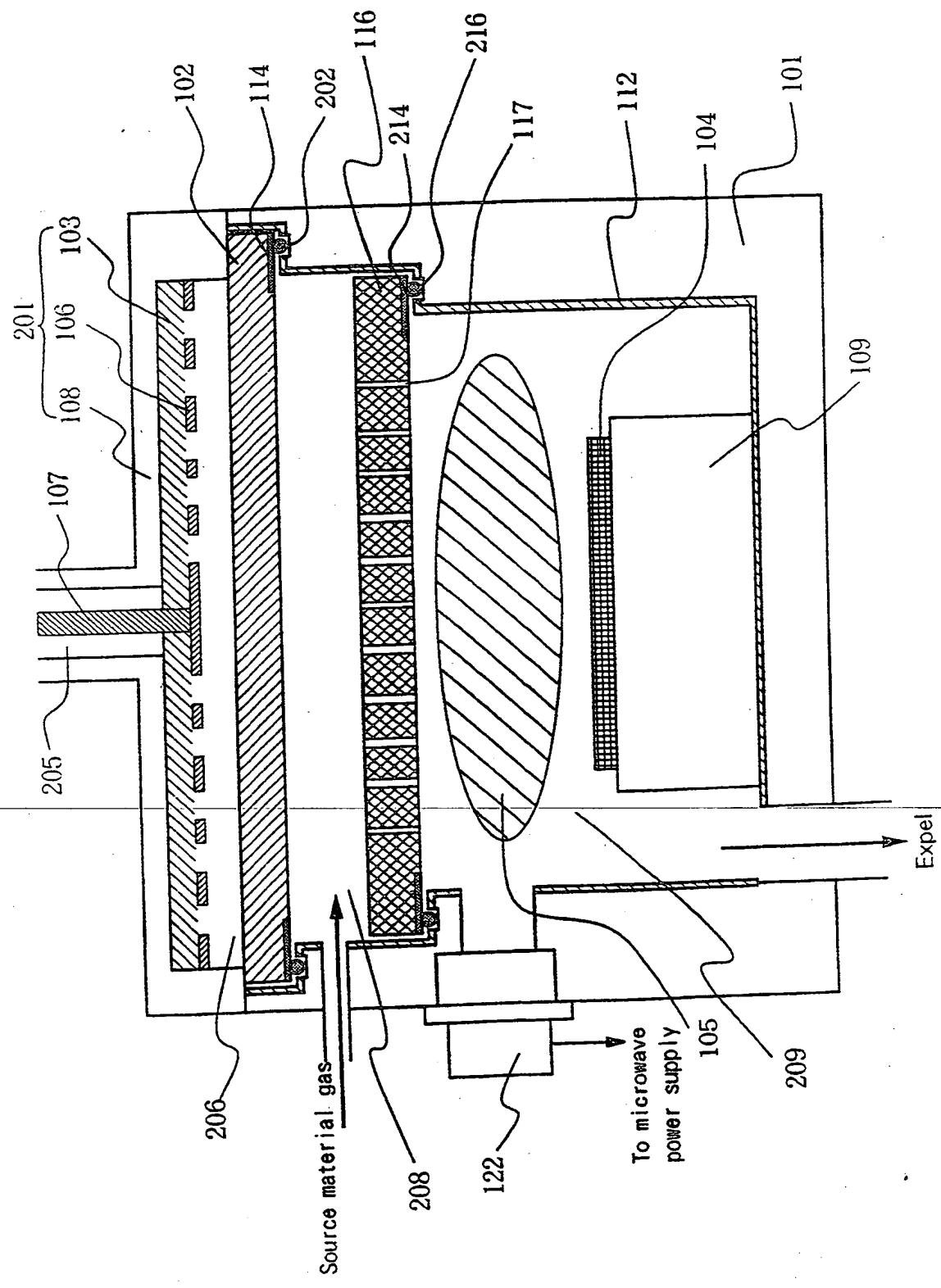


Fig. 24

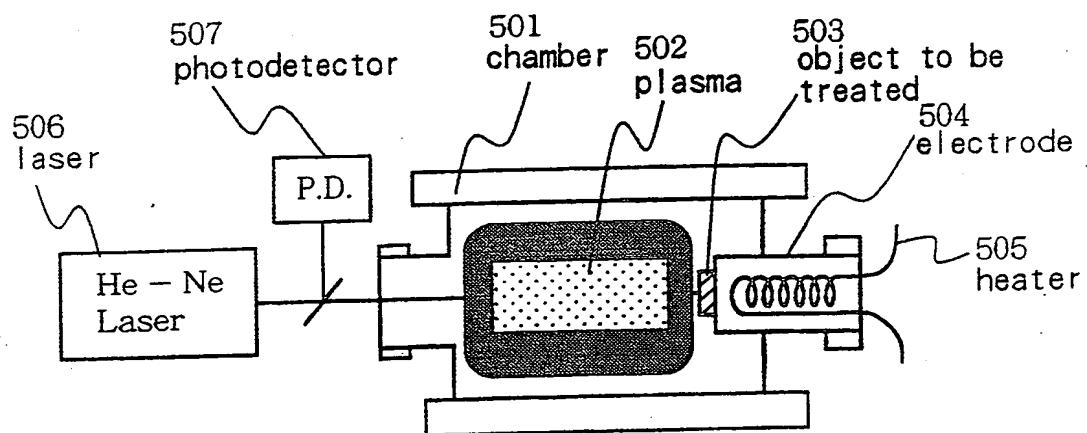


Fig. 25

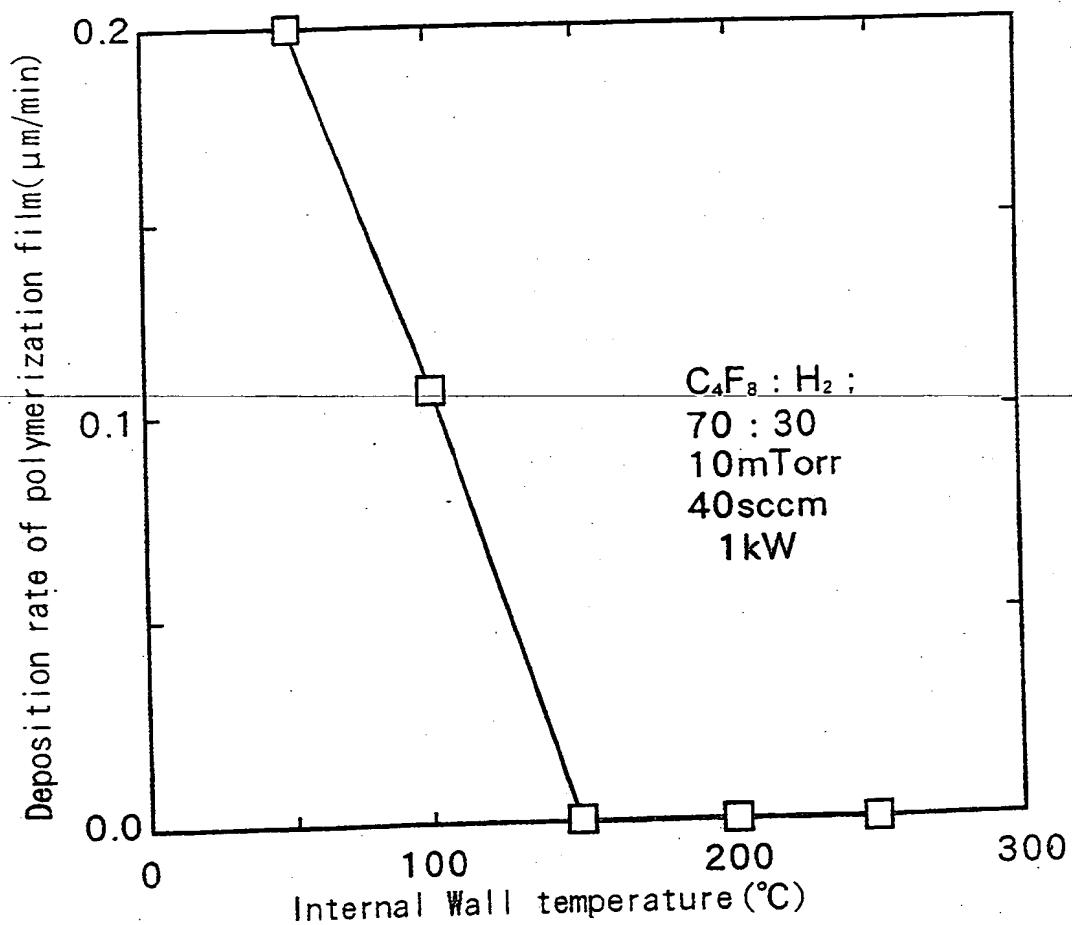


Fig. 26

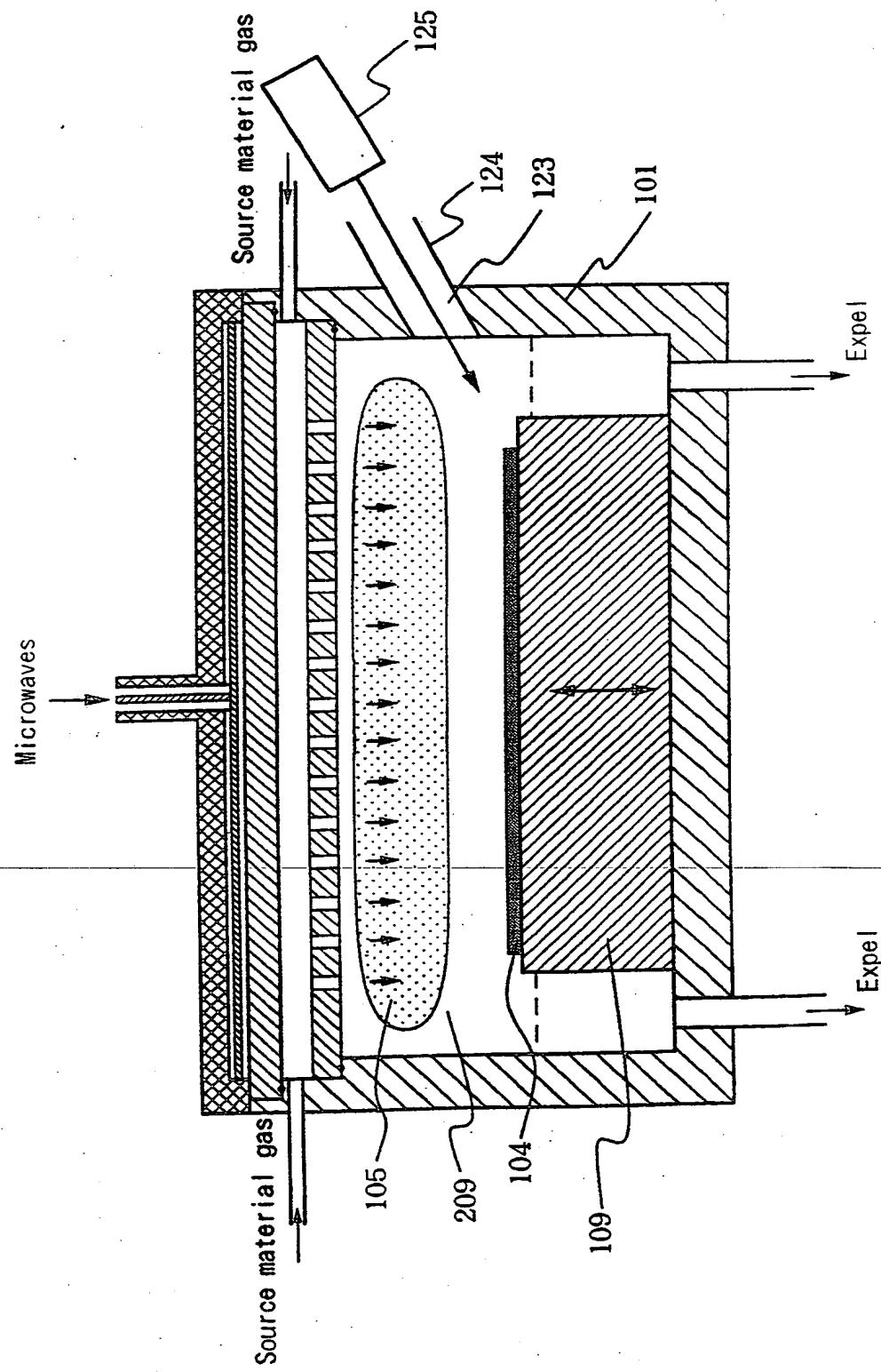
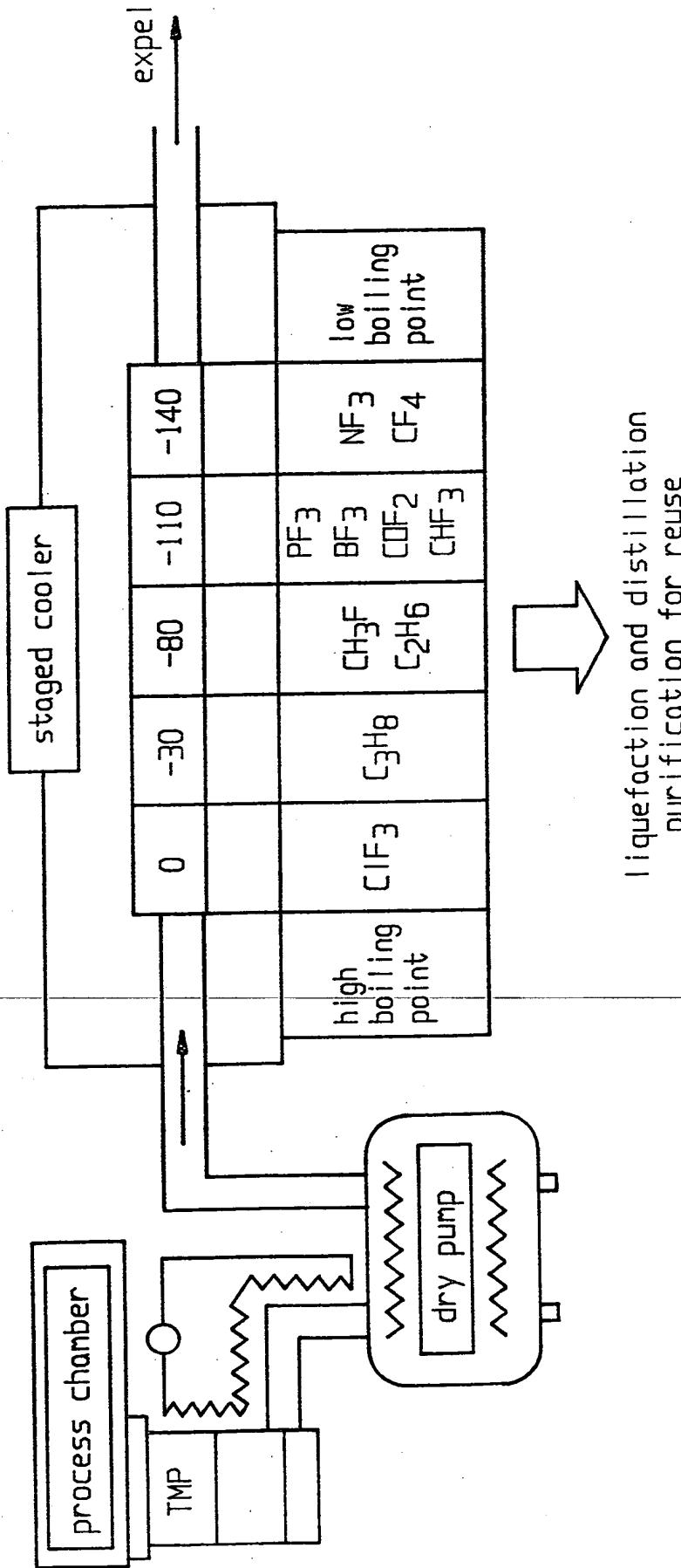


Fig. 27

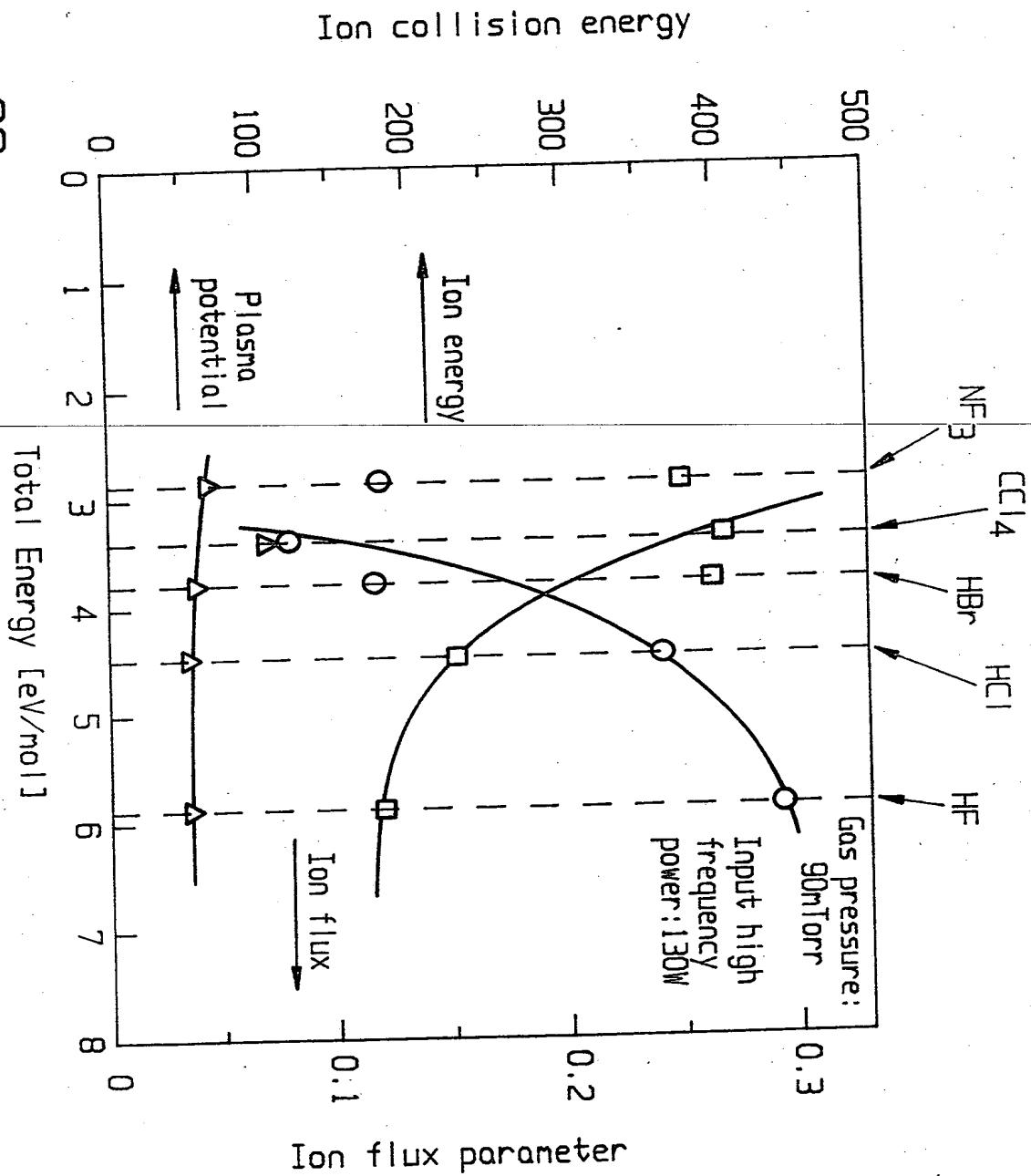
collection and reuse of fluorocarbon type gas
staged cooler system



global warming effects of fluorocarbon
are 100,000 - 1,000,000 greater than CO₂

Fig. 28

Fig. 29



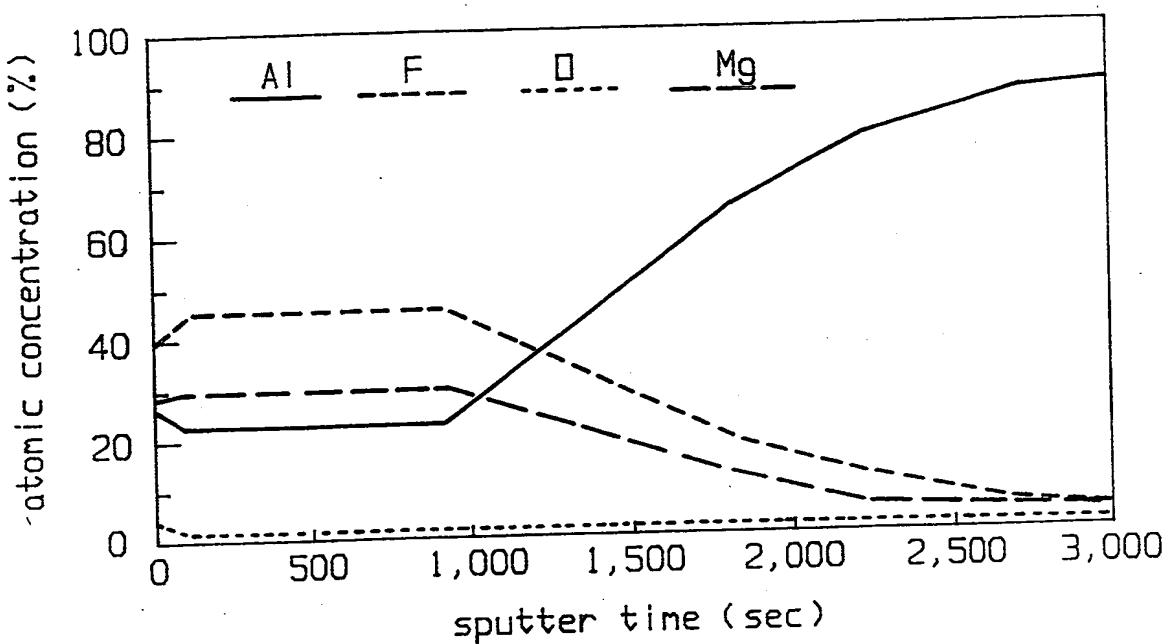


Fig. 30A

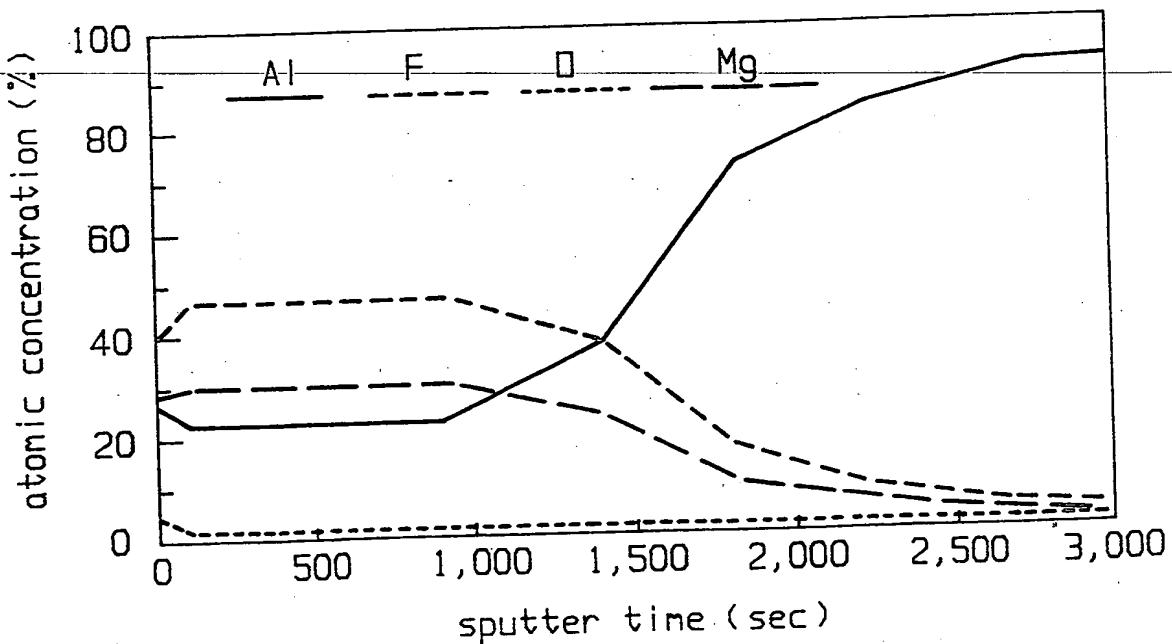


Fig. 30B

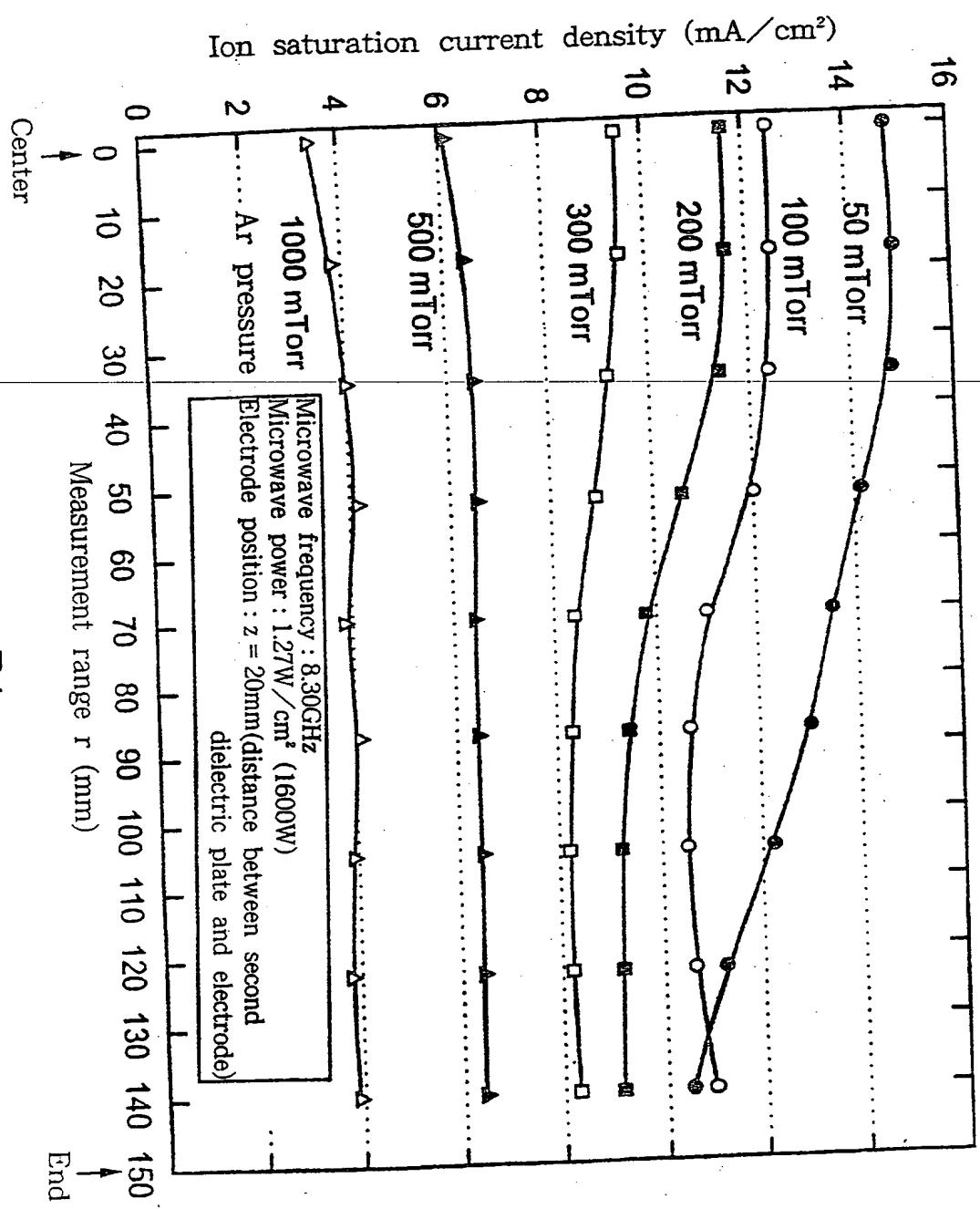


Fig. 31

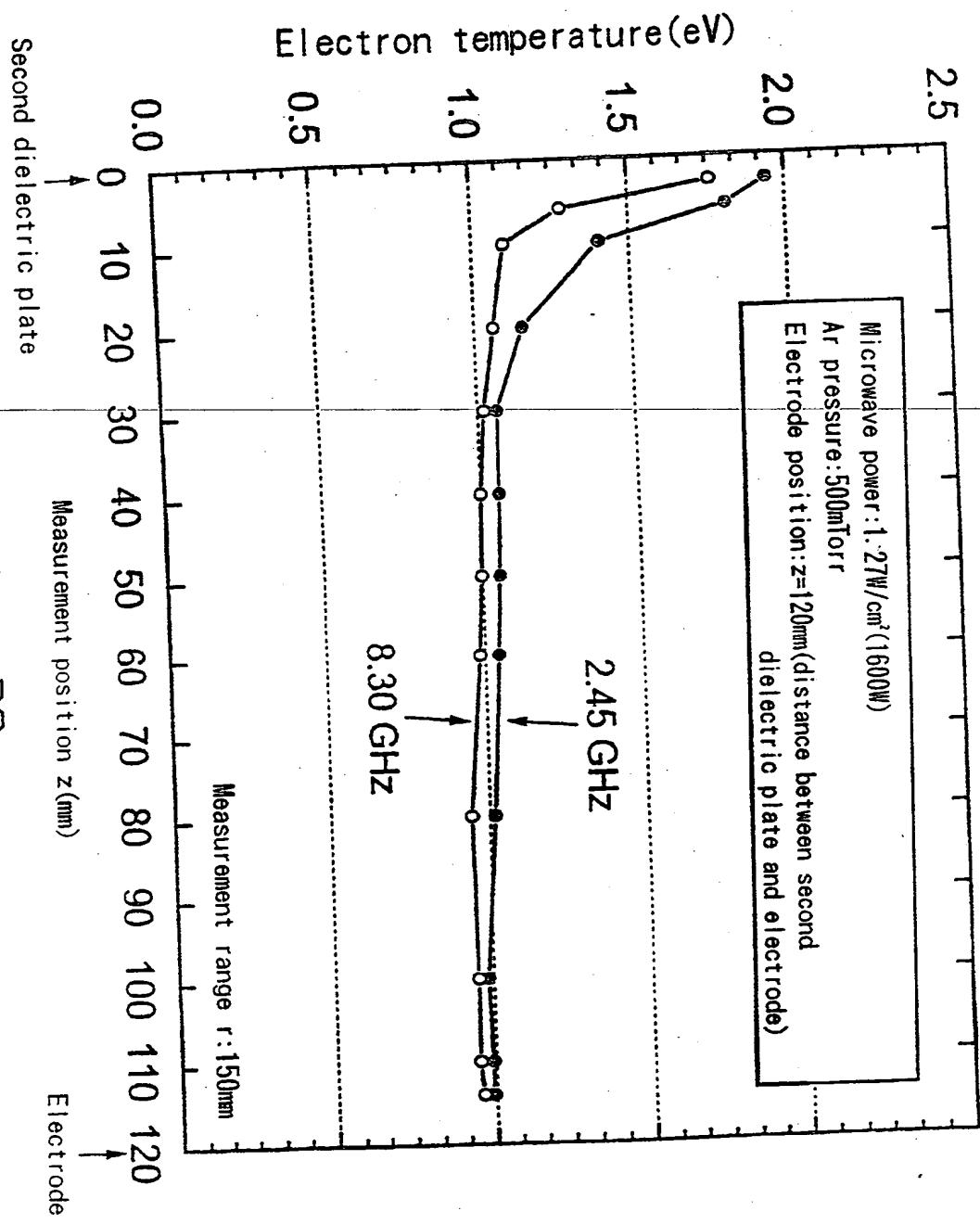


Fig. 32

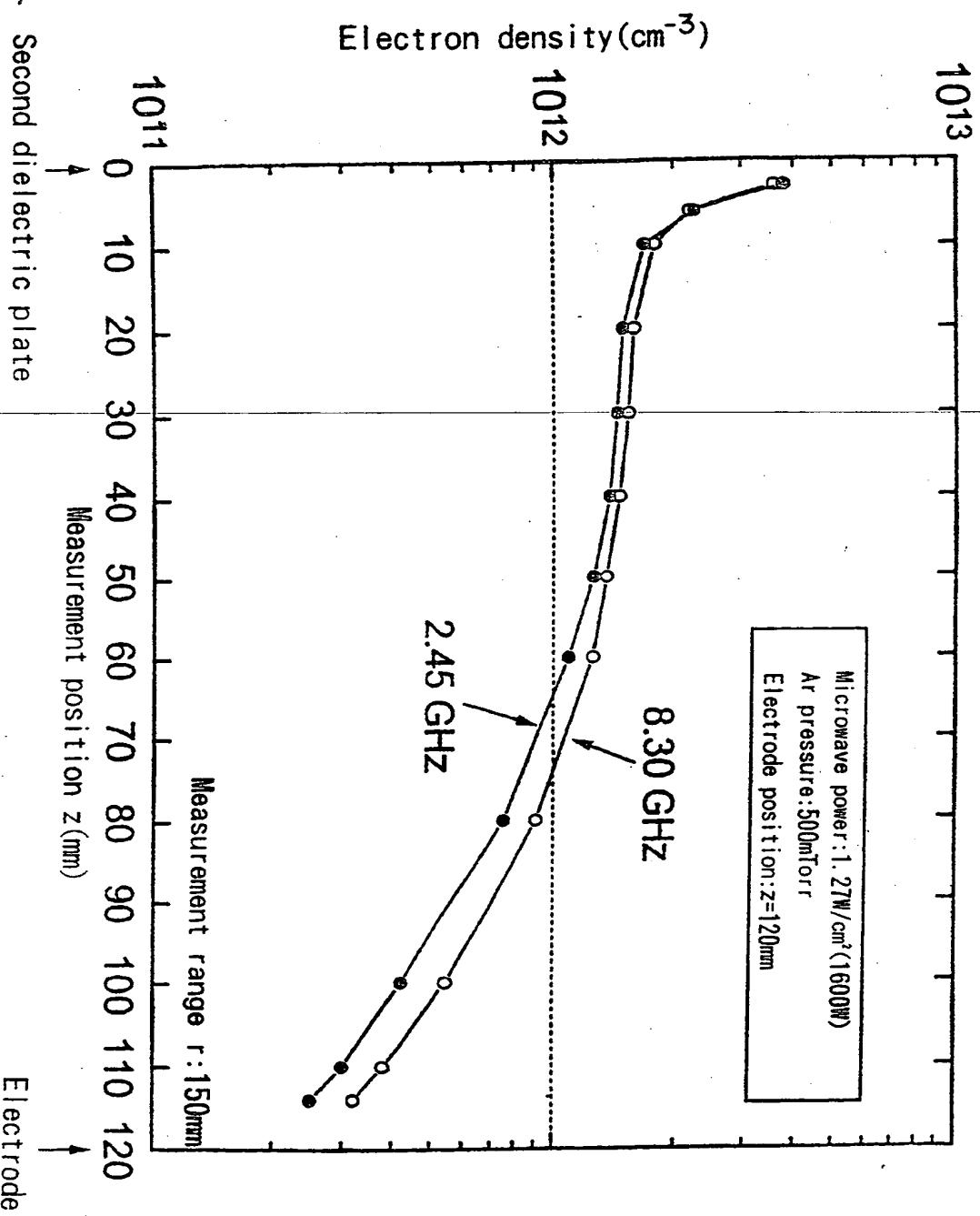


Fig. 33

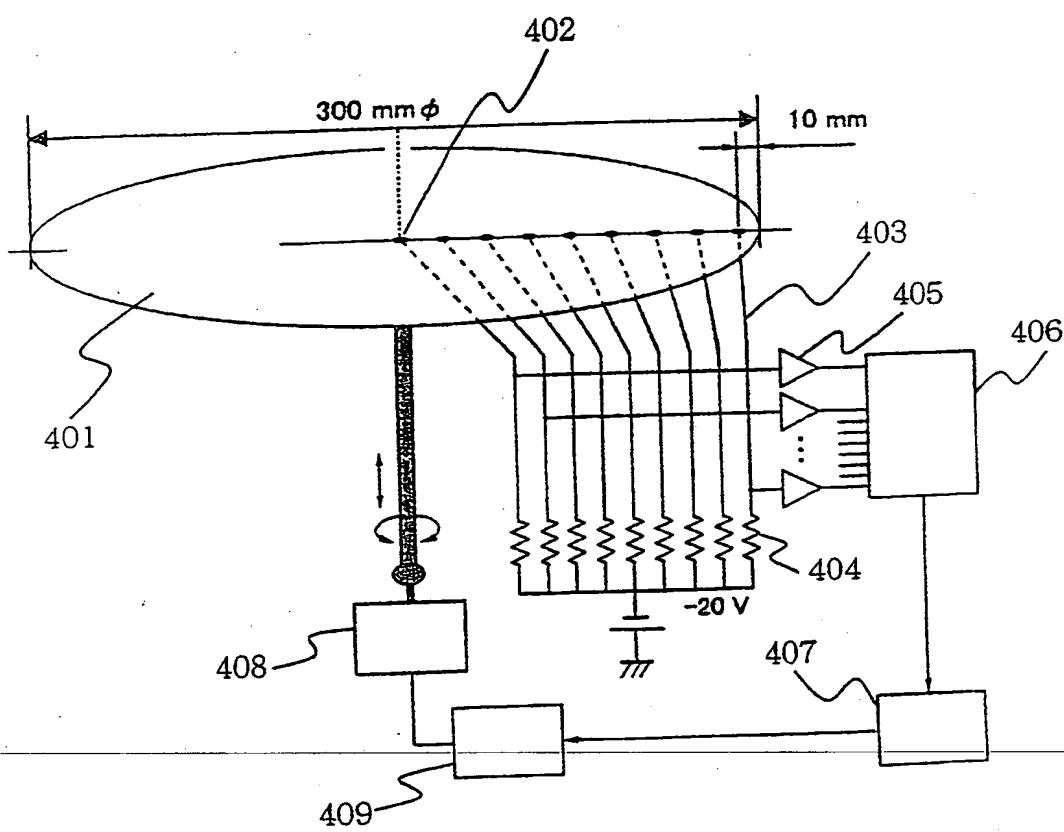


Fig. 34

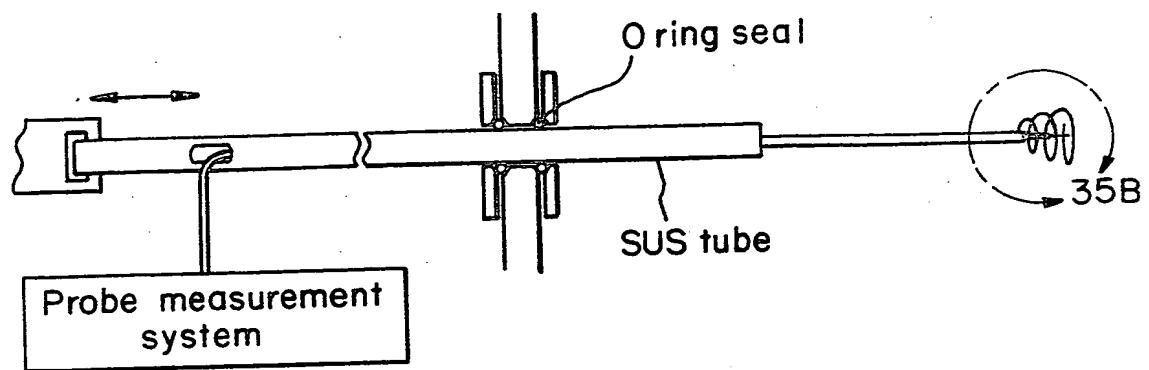


Fig. 35A

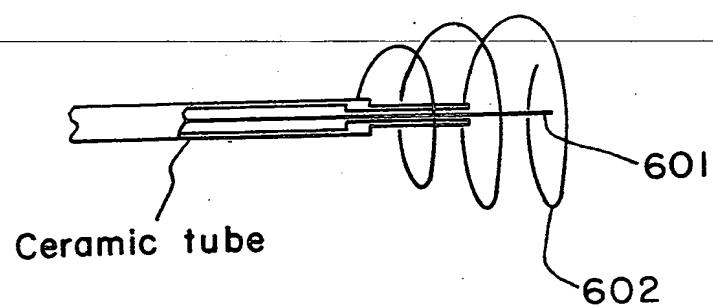


Fig. 35B

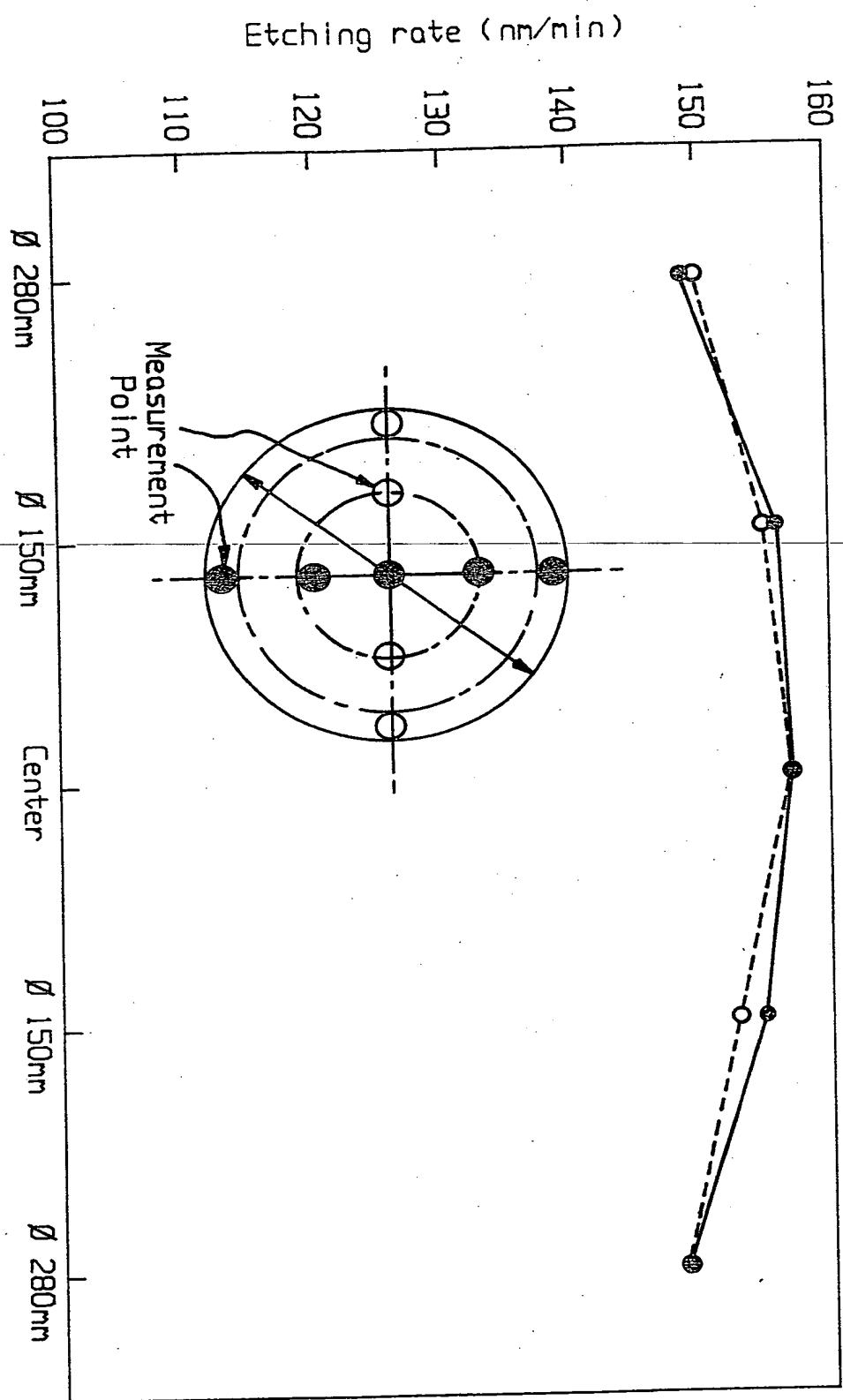


Fig. 36

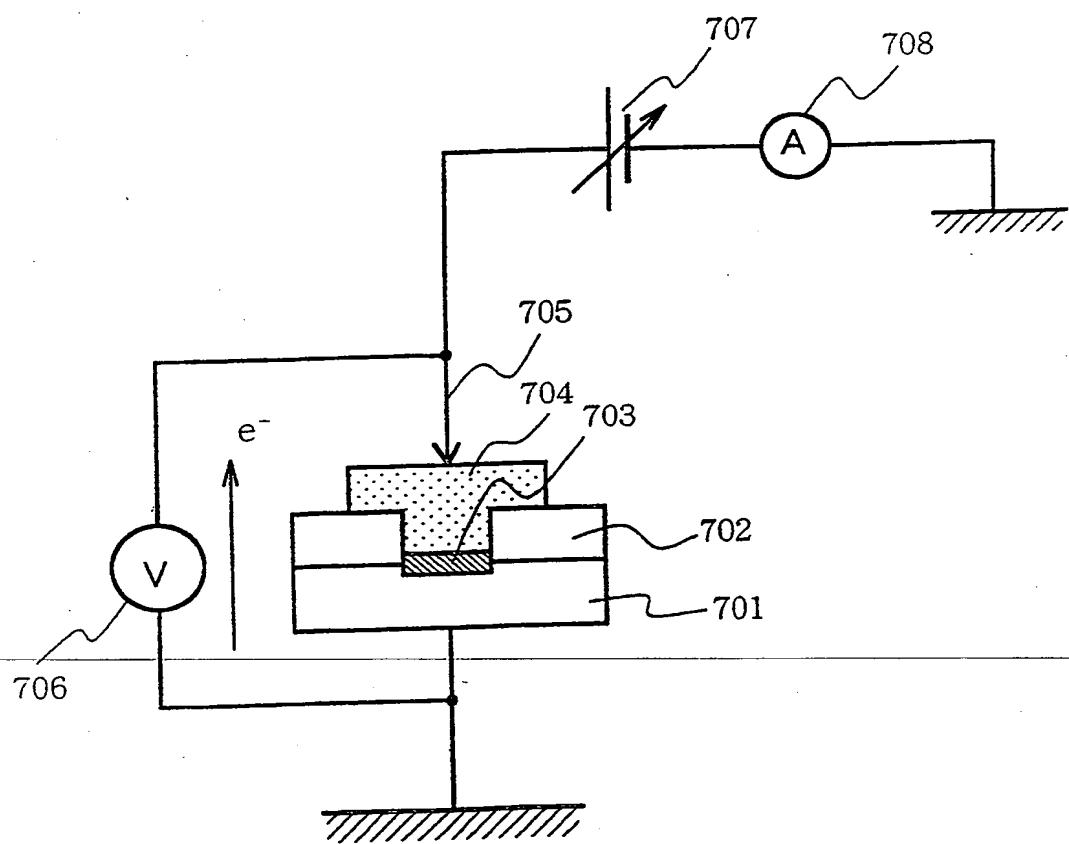


Fig. 37

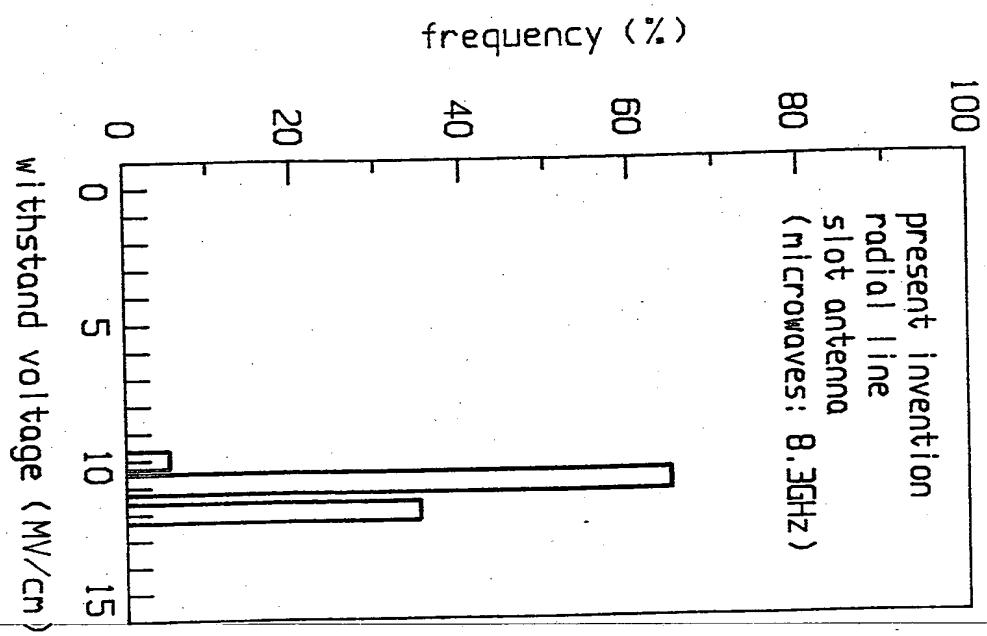


Fig. 38A

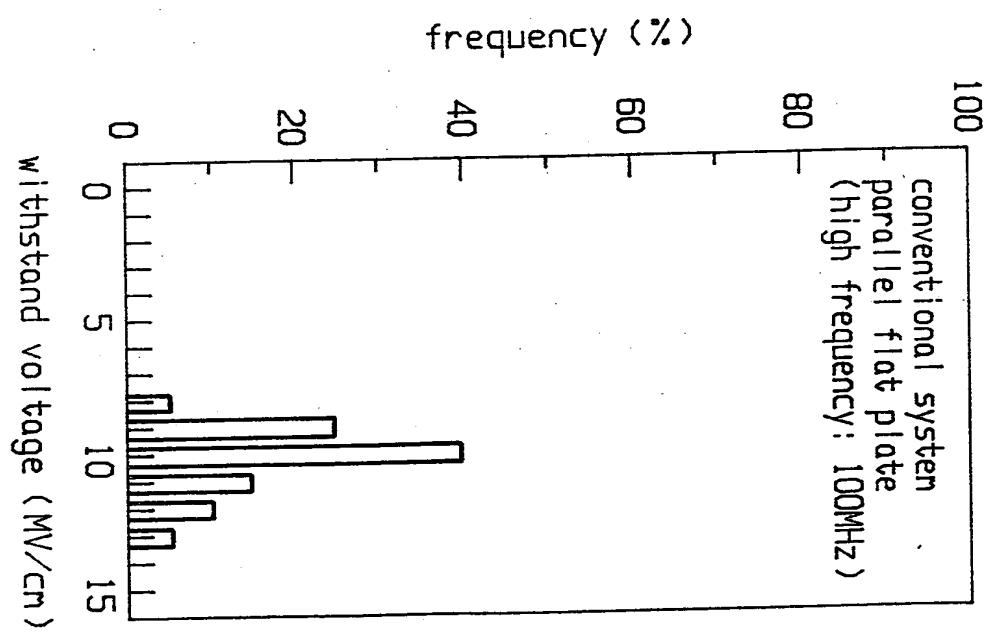


Fig. 38B

Silicon nitride film formed at 1300°C using conventional system

Silicon nitride film formed at 450°C using device of the present invention

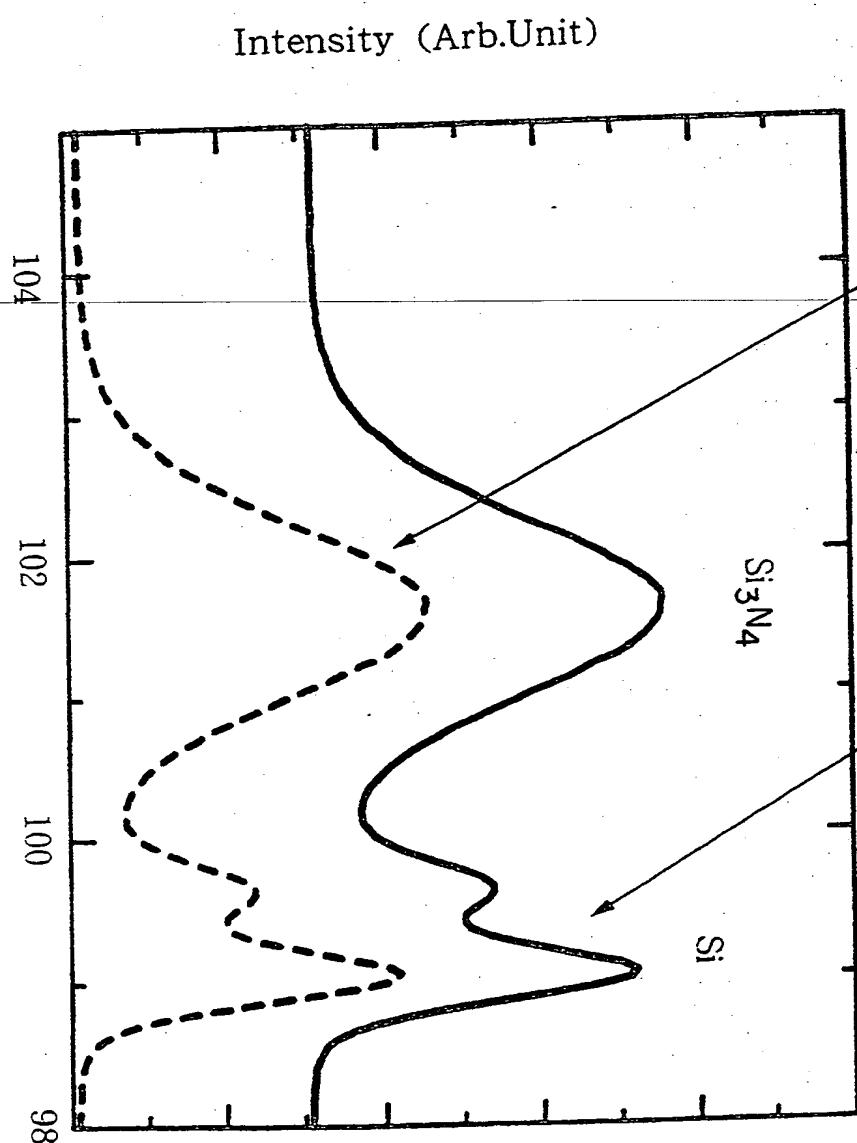


Fig. 39

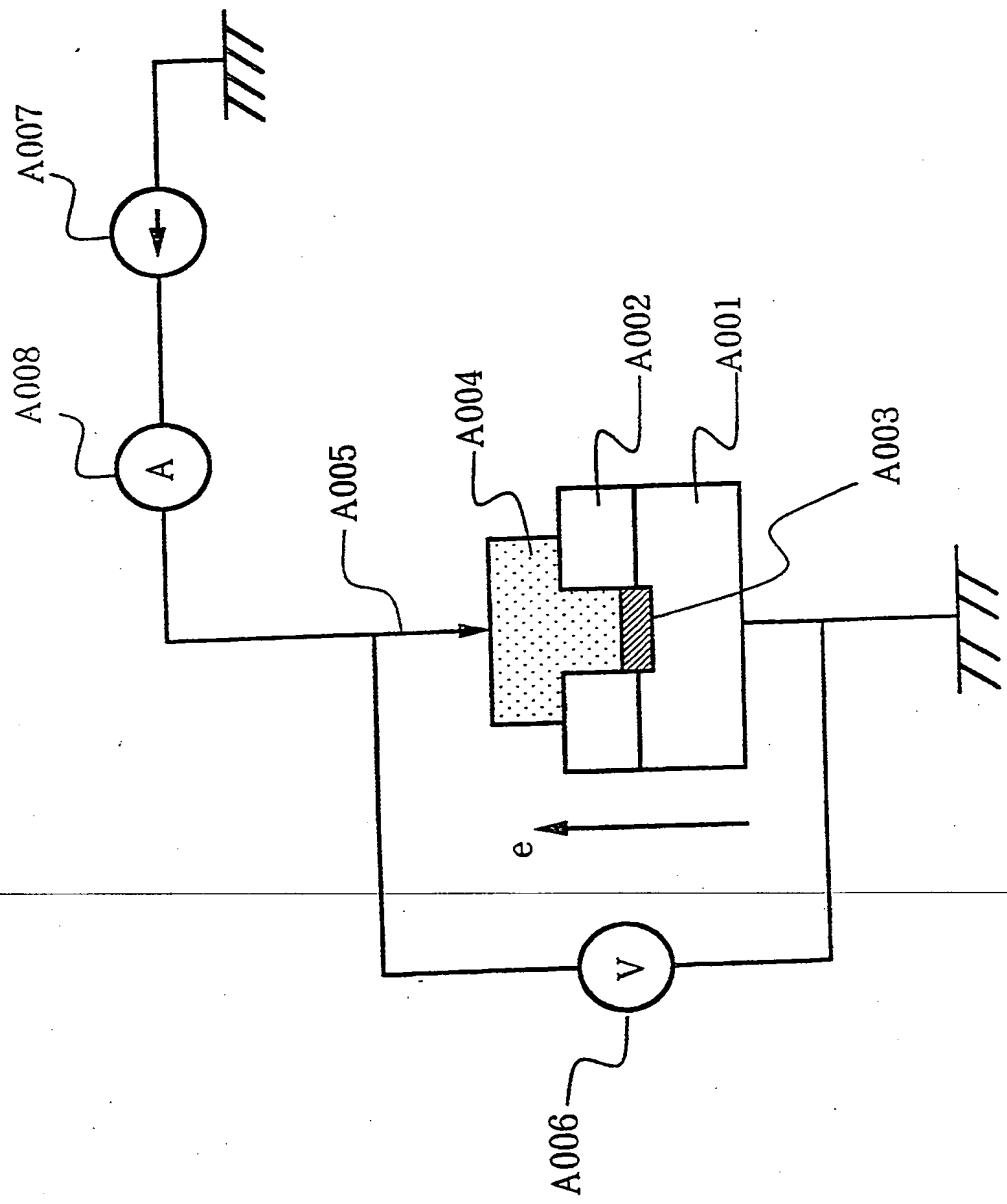


Fig. 40

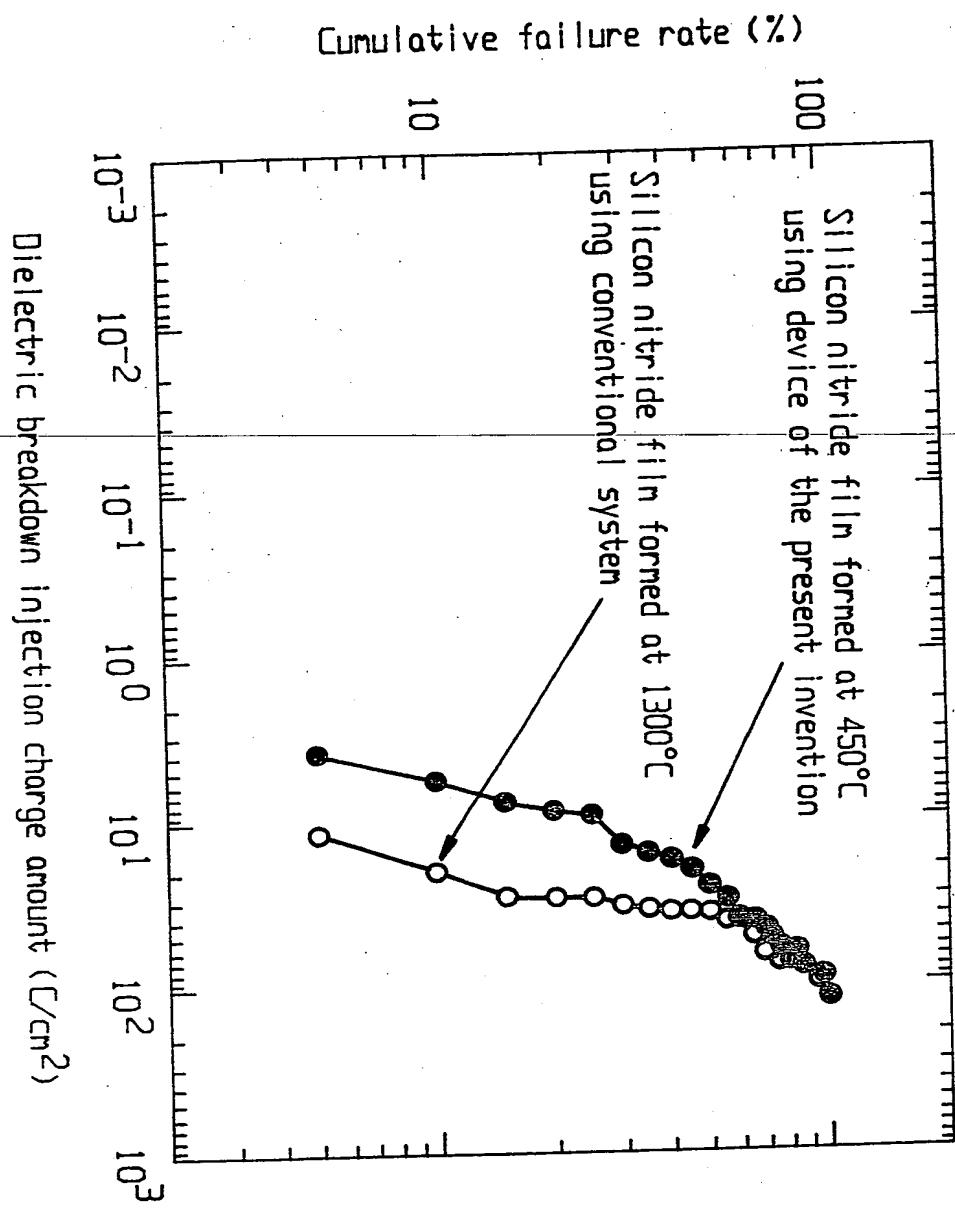


Fig. 41

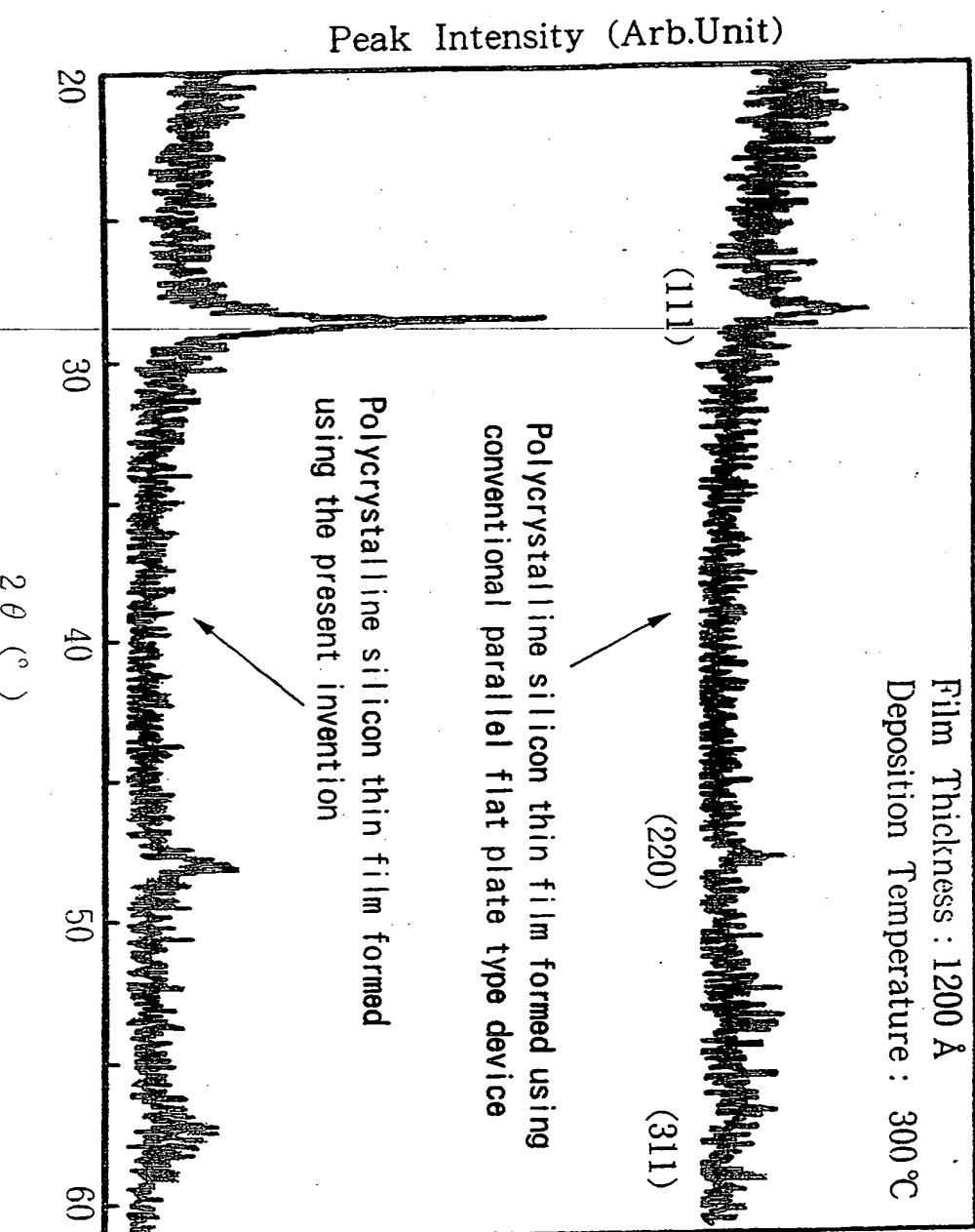
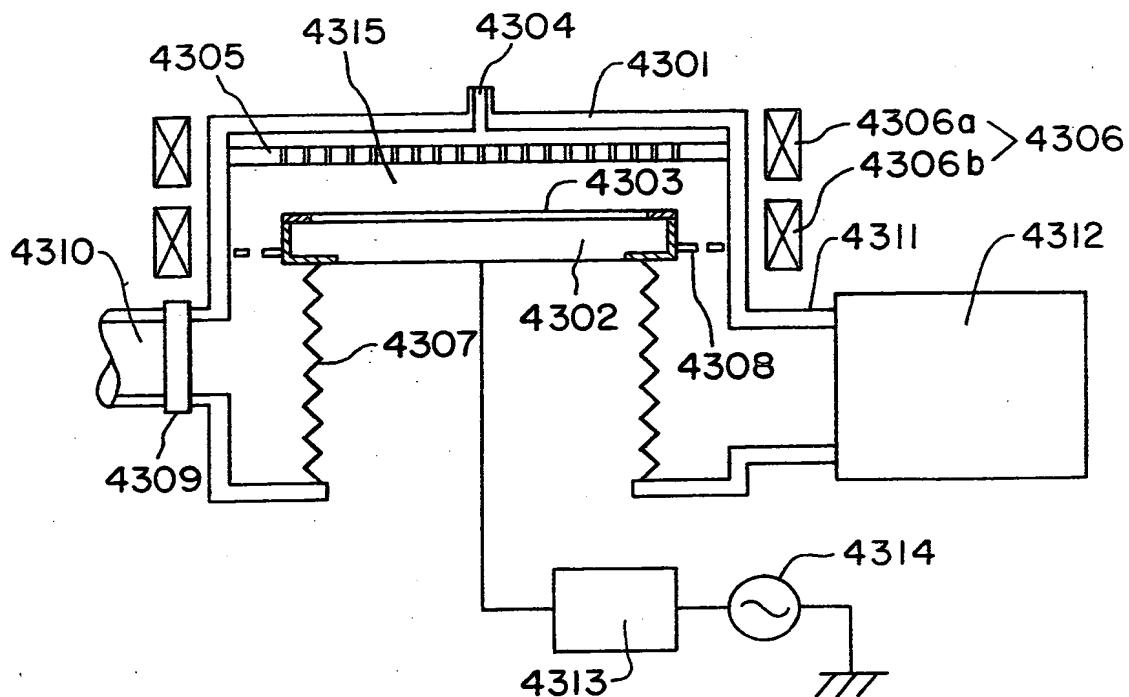
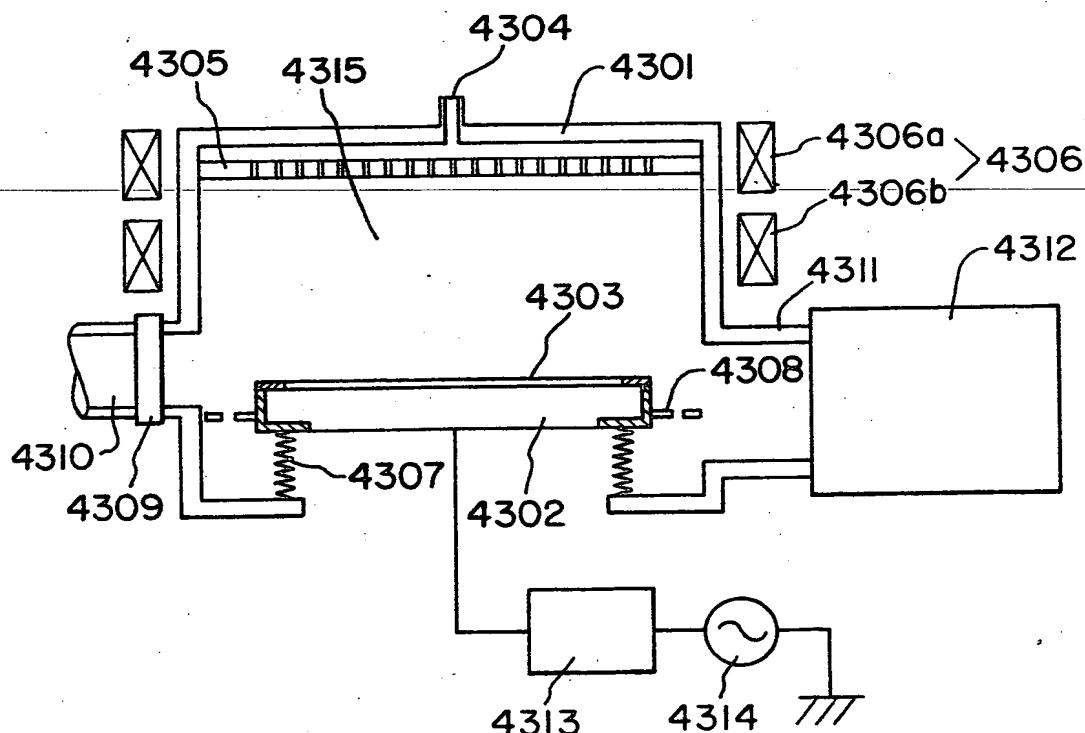


Fig. 42



PRIOR ART

Fig. 43A



PRIOR ART

Fig. 43B

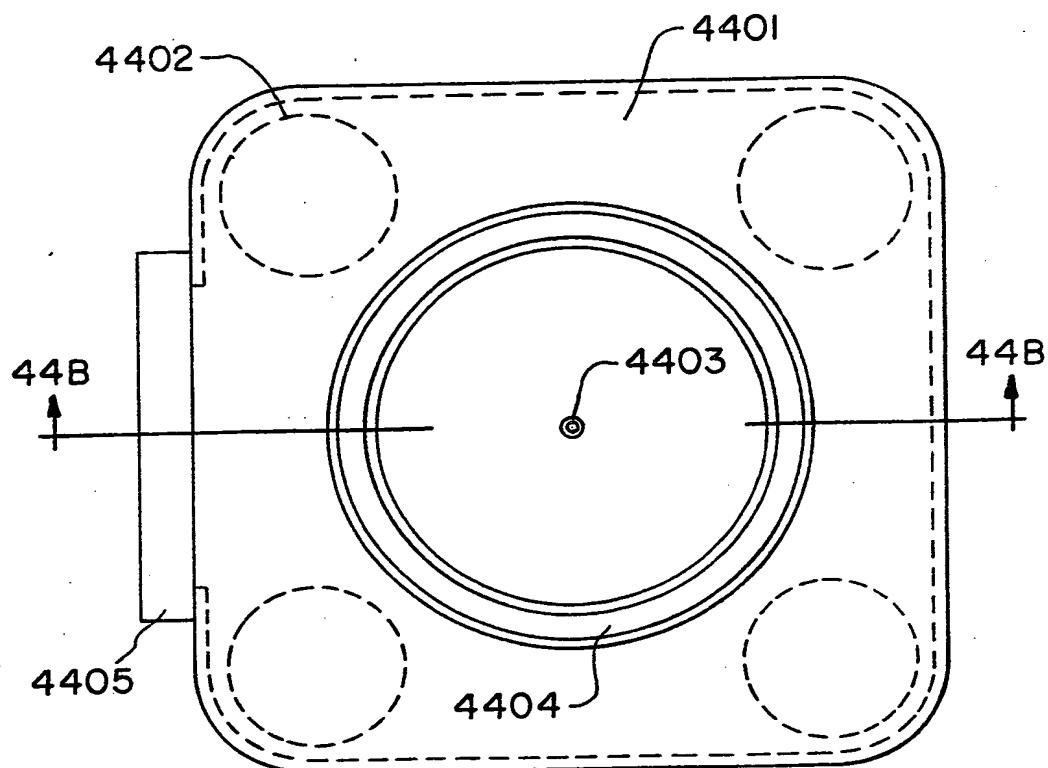


Fig. 44A

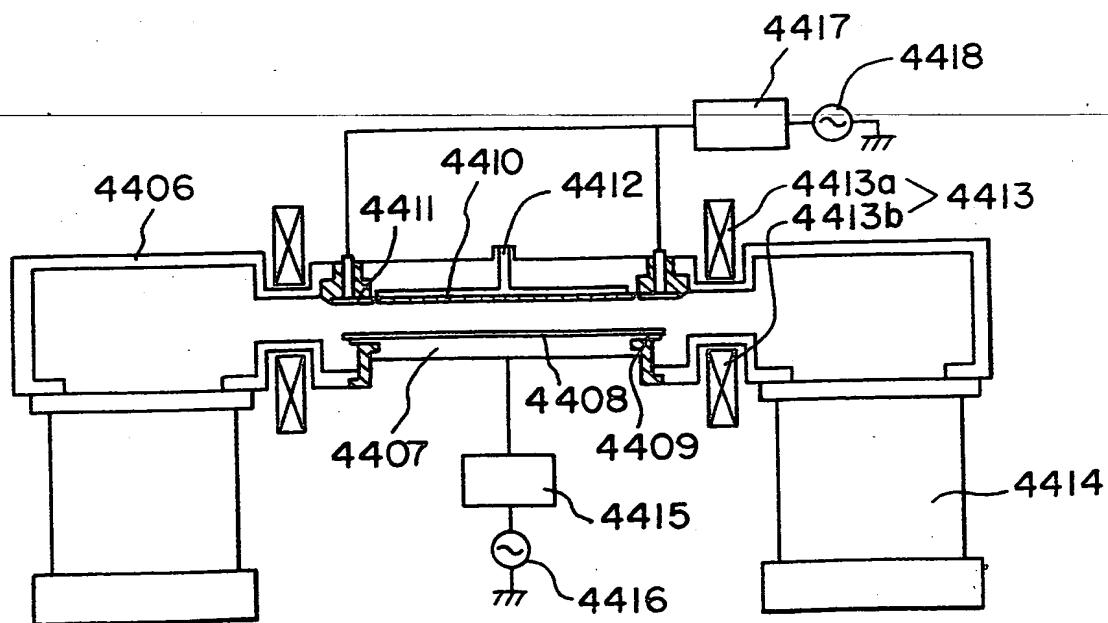


Fig. 44B

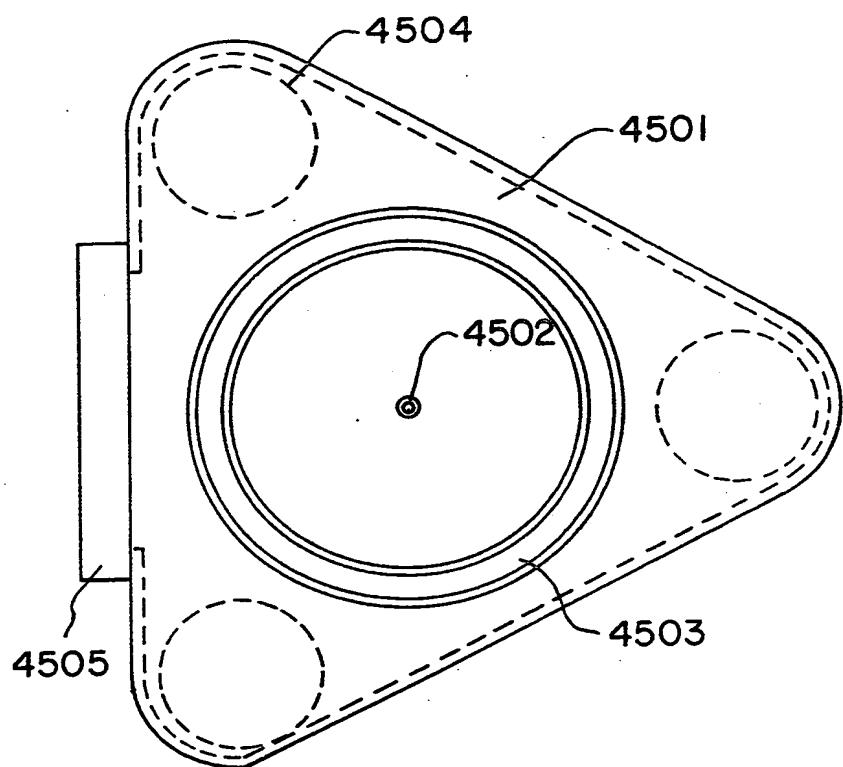


Fig. 45

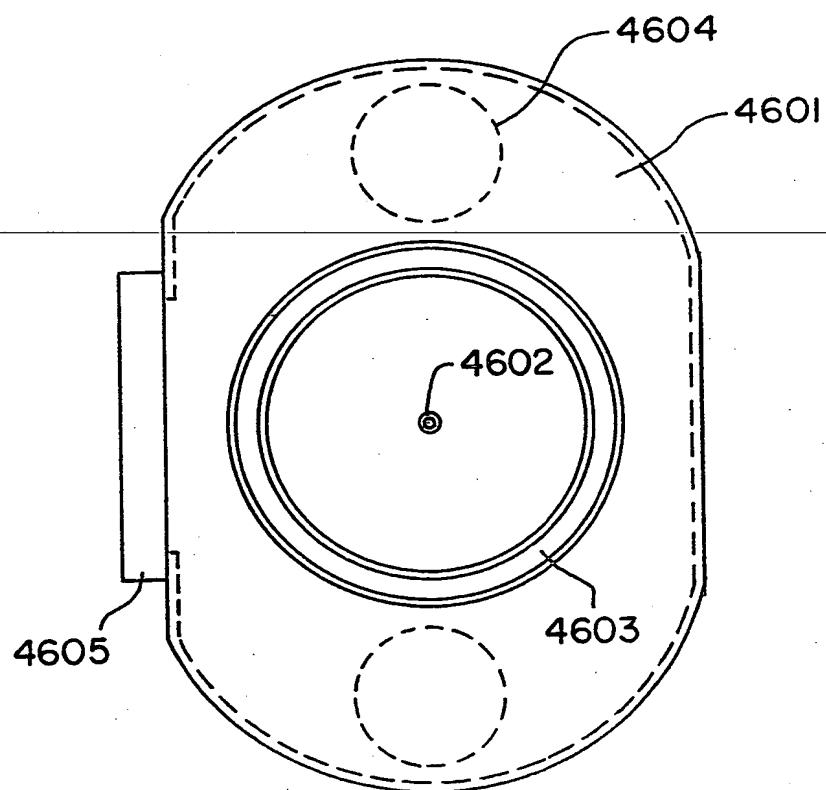


Fig. 46

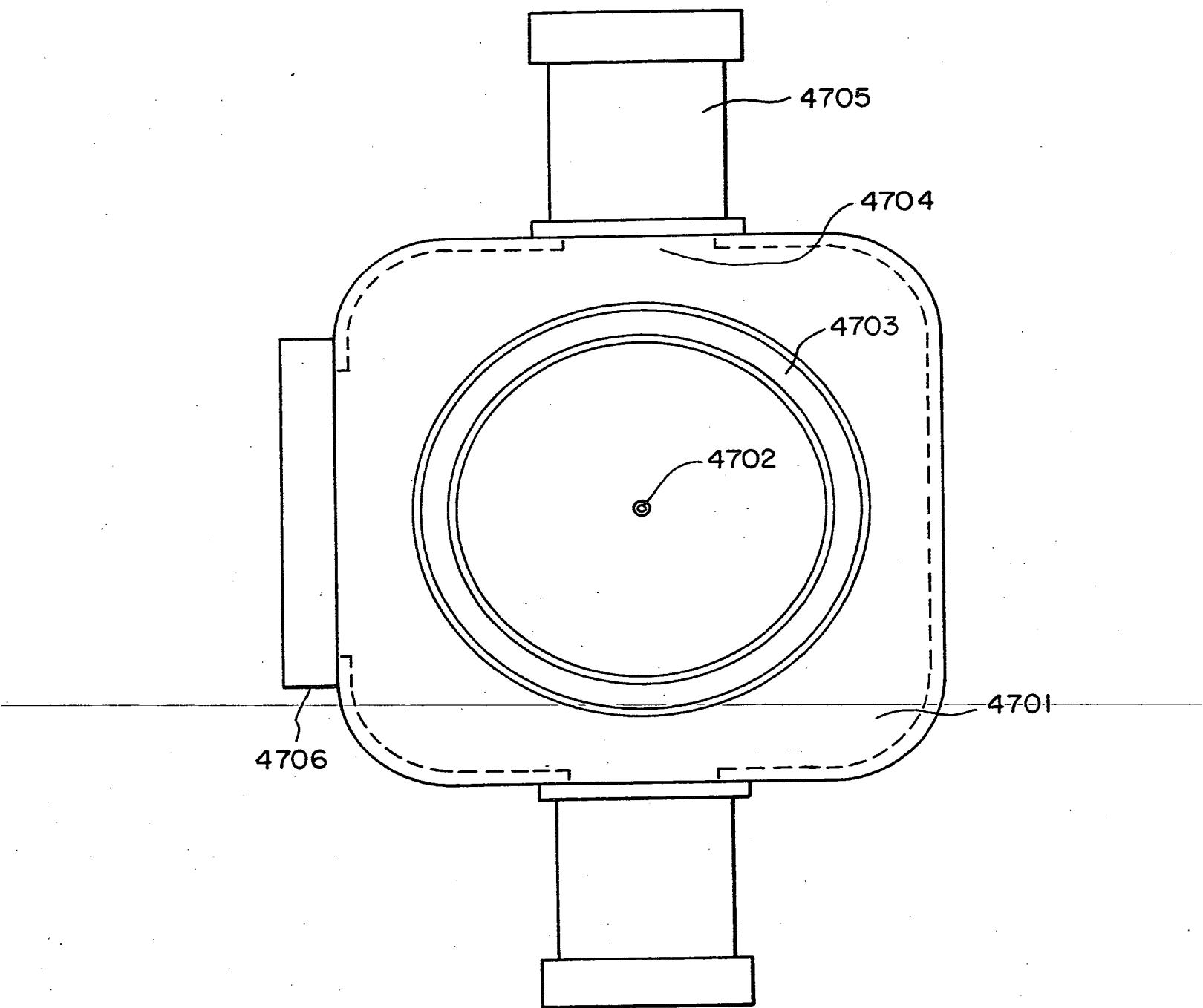


Fig. 47

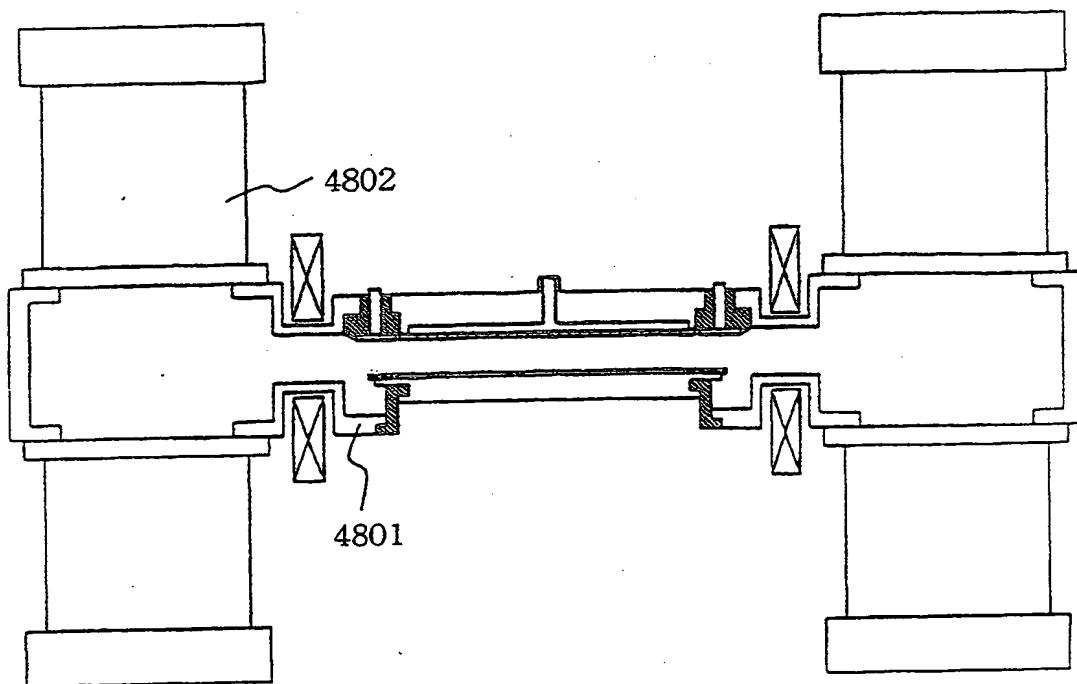


Fig. 48

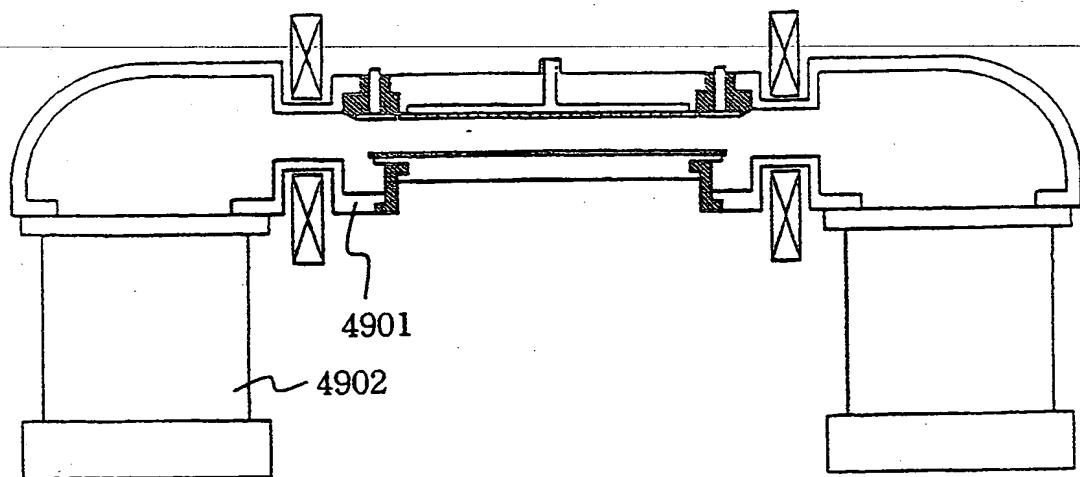


Fig. 49

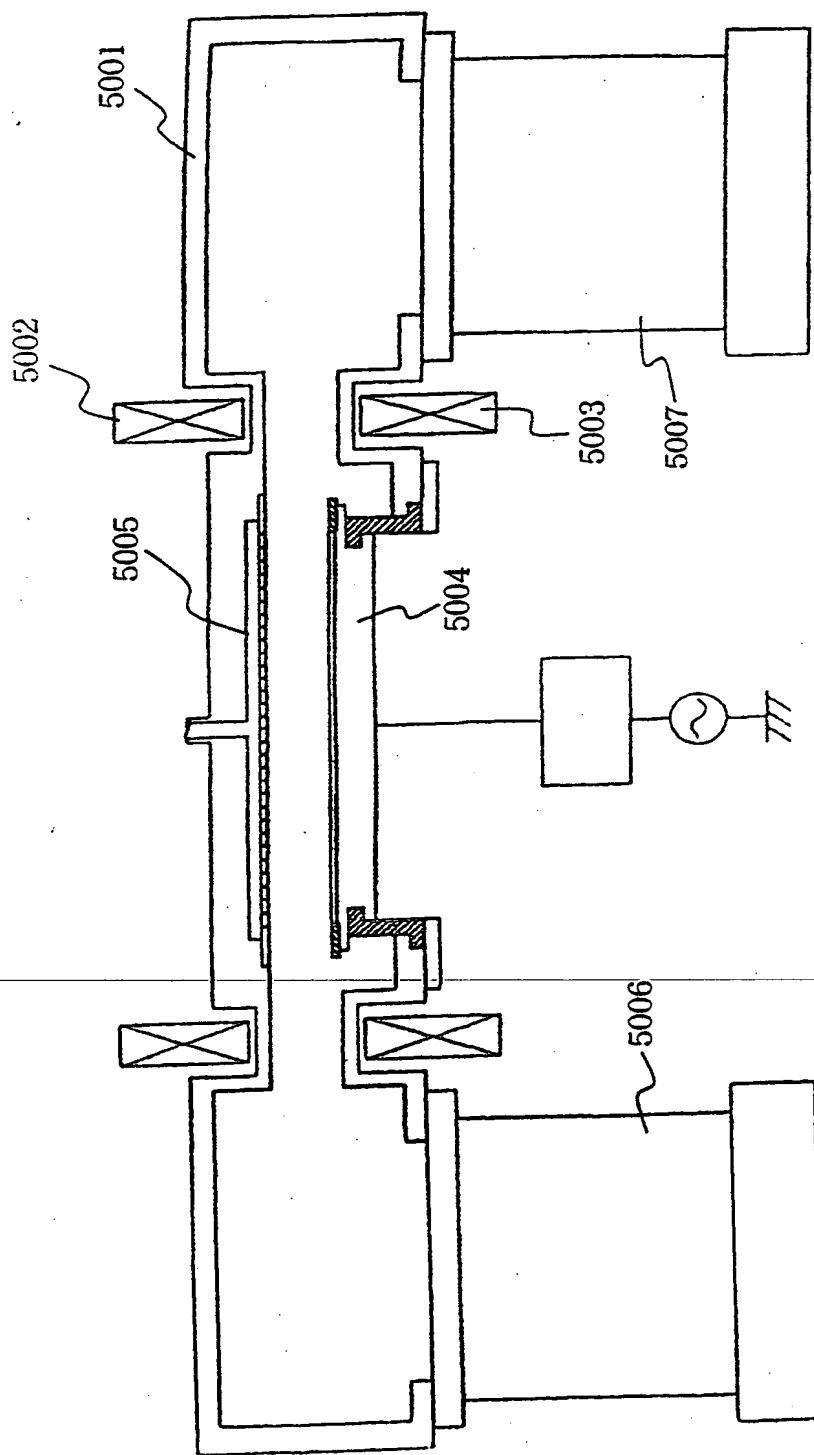


Fig. 50

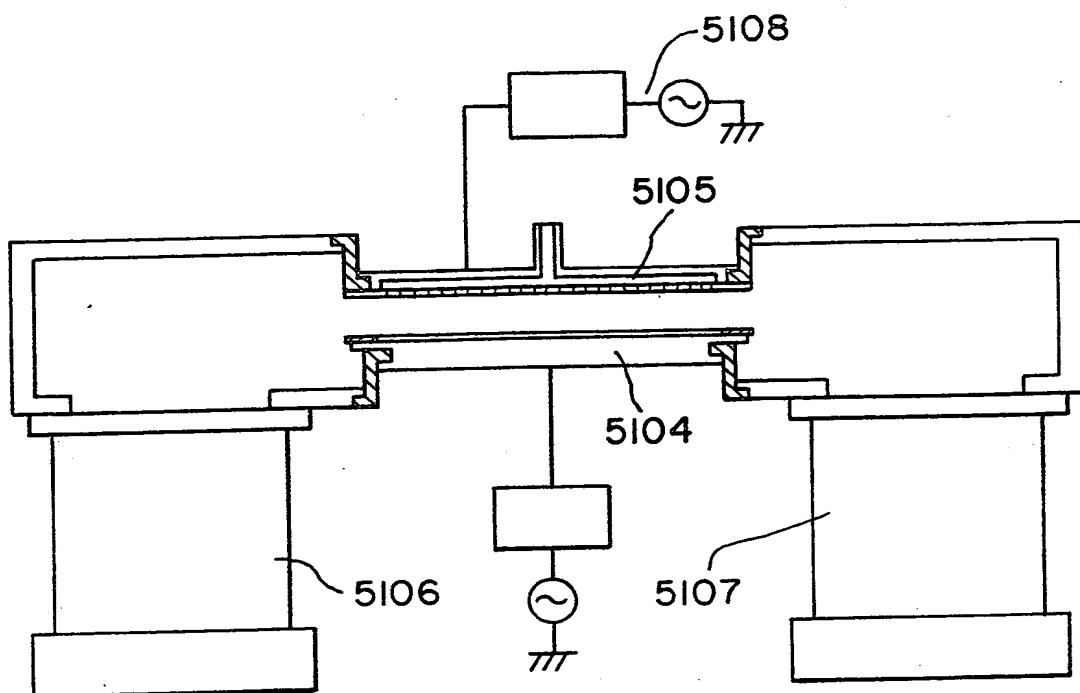


Fig. 51

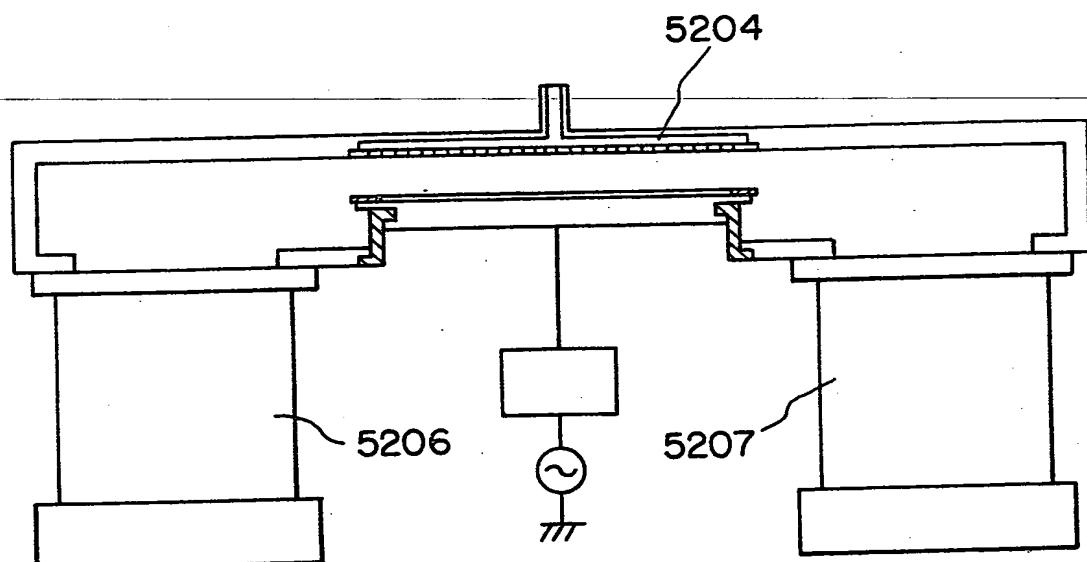


Fig. 52

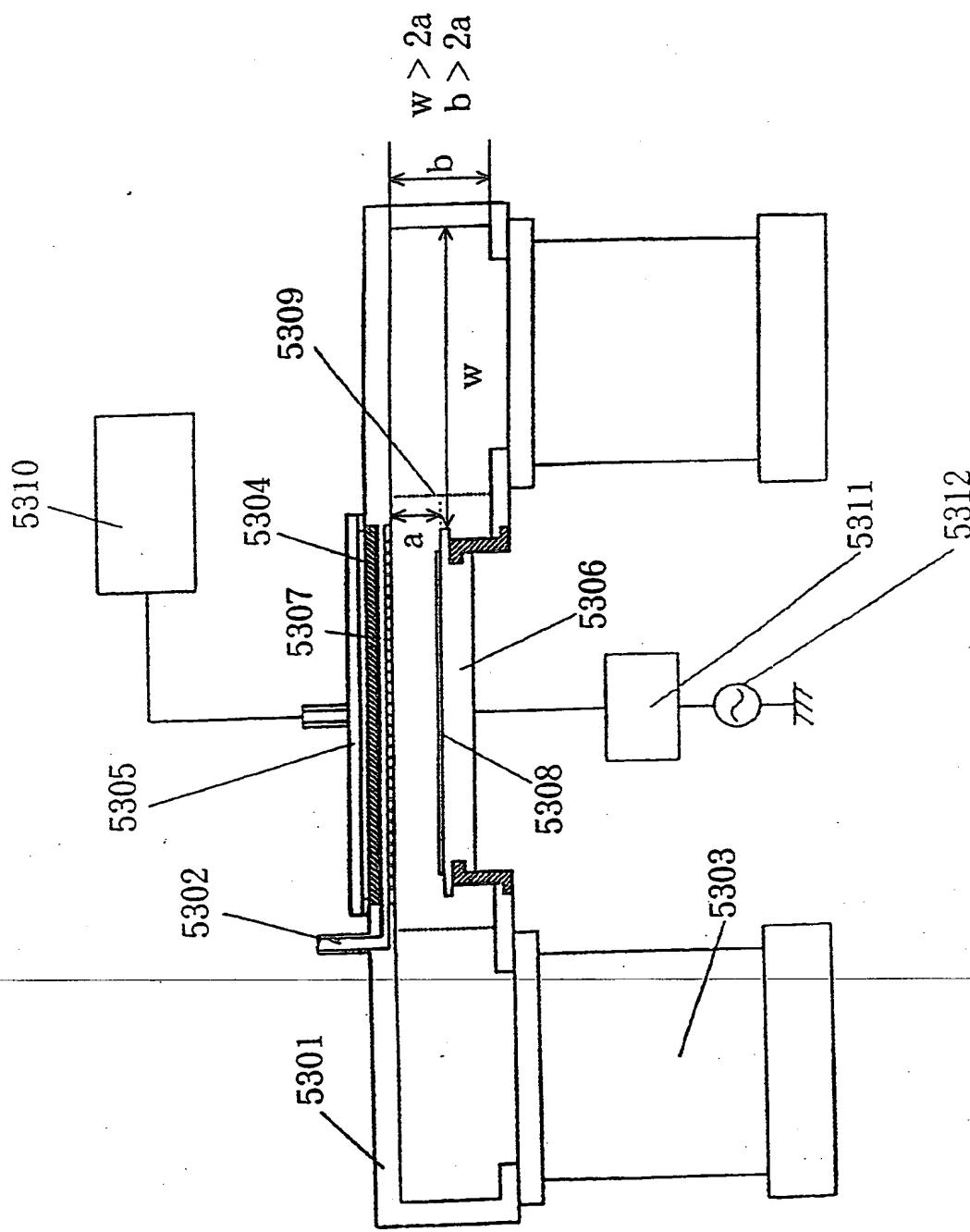


Fig. 53

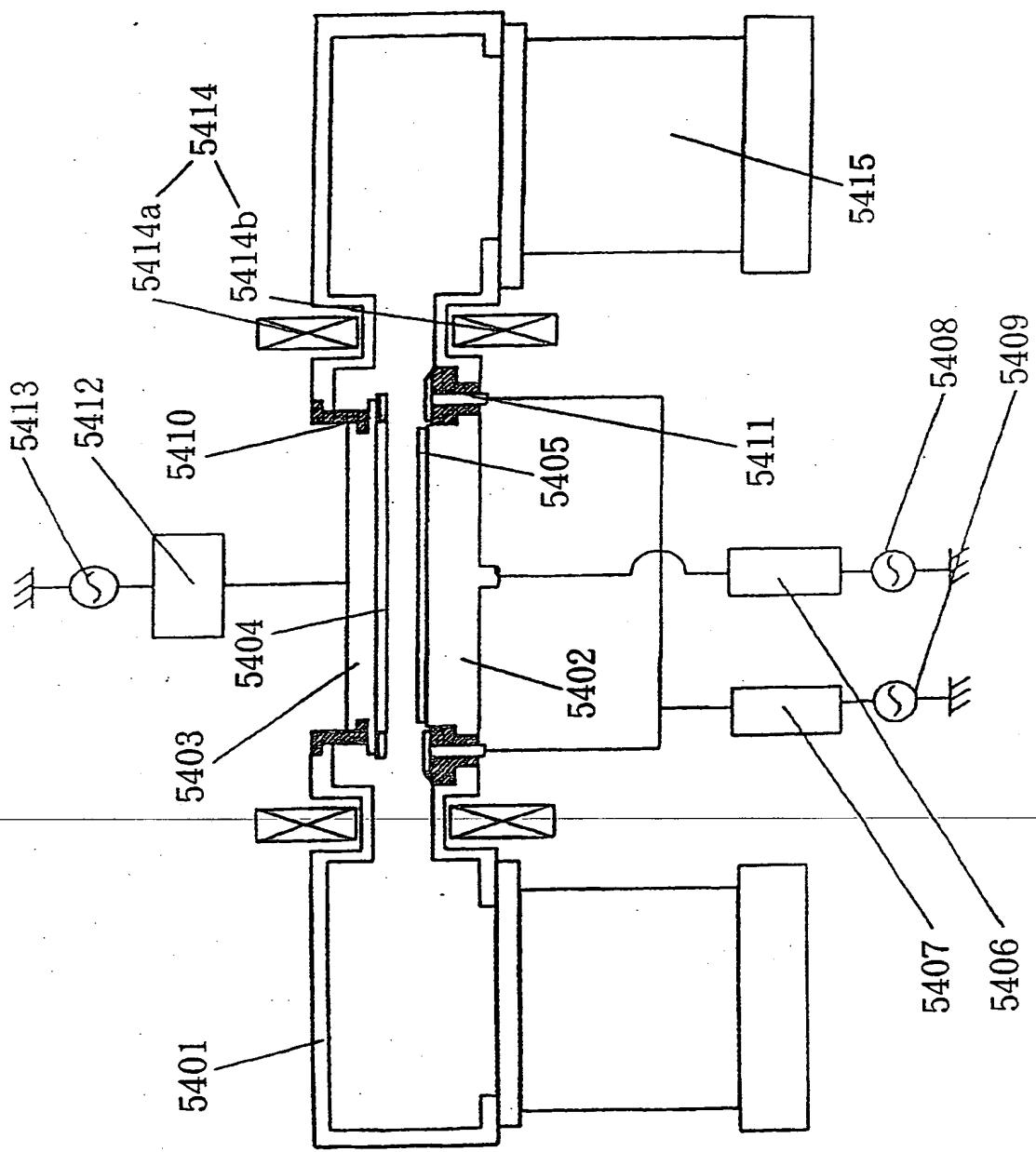


Fig. 54

Fig. 56

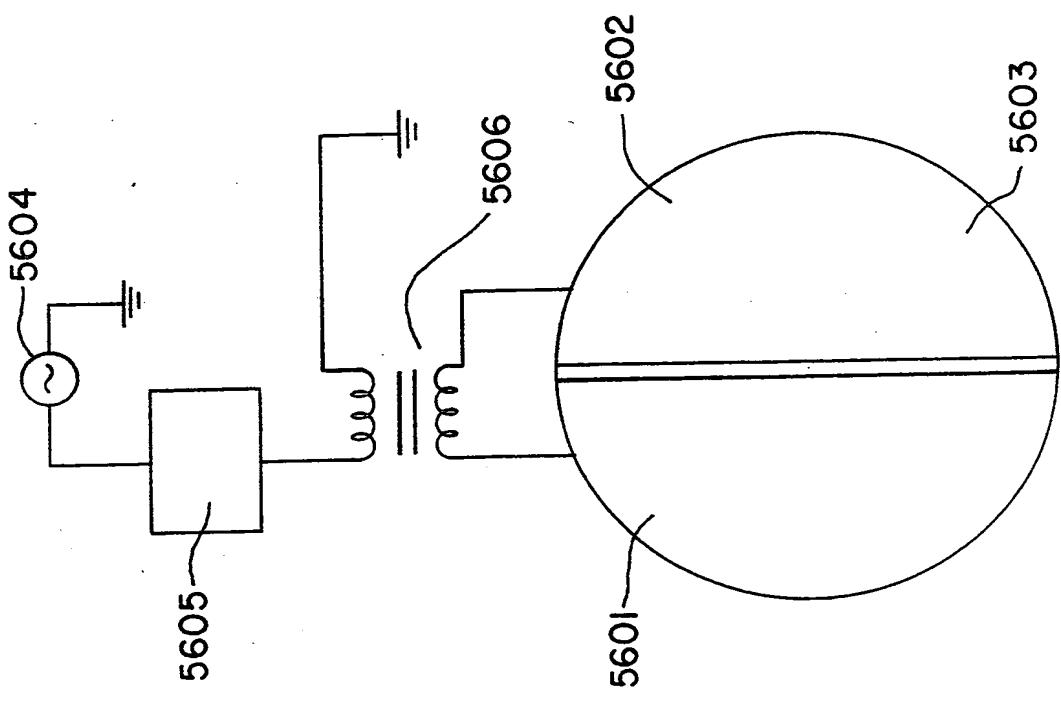
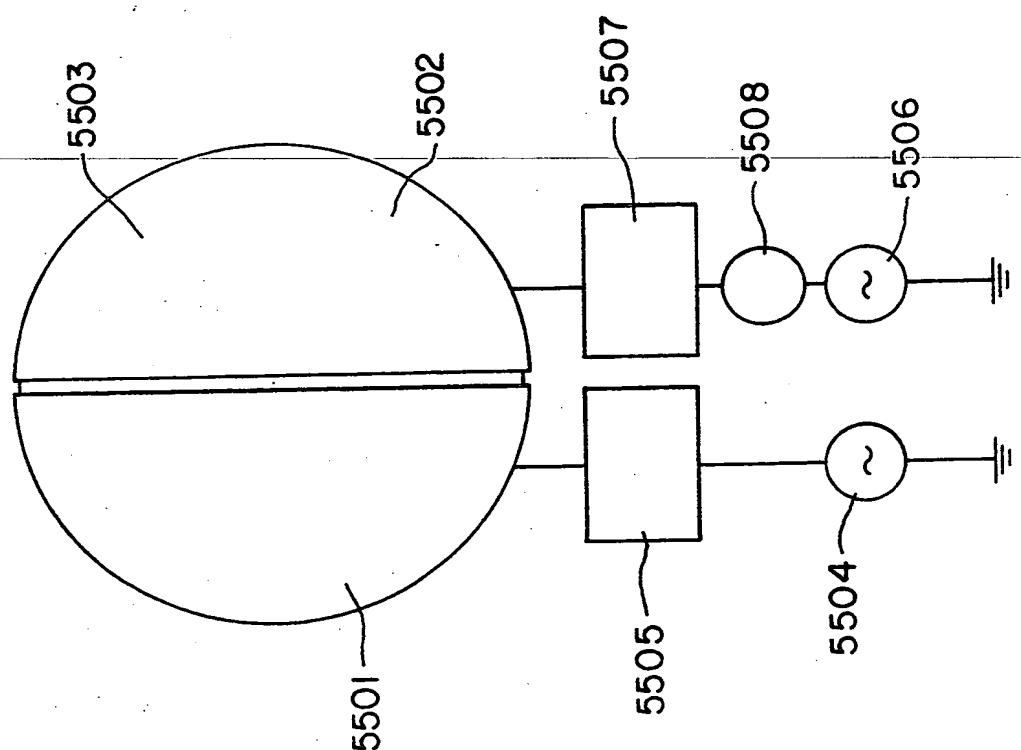


Fig. 55



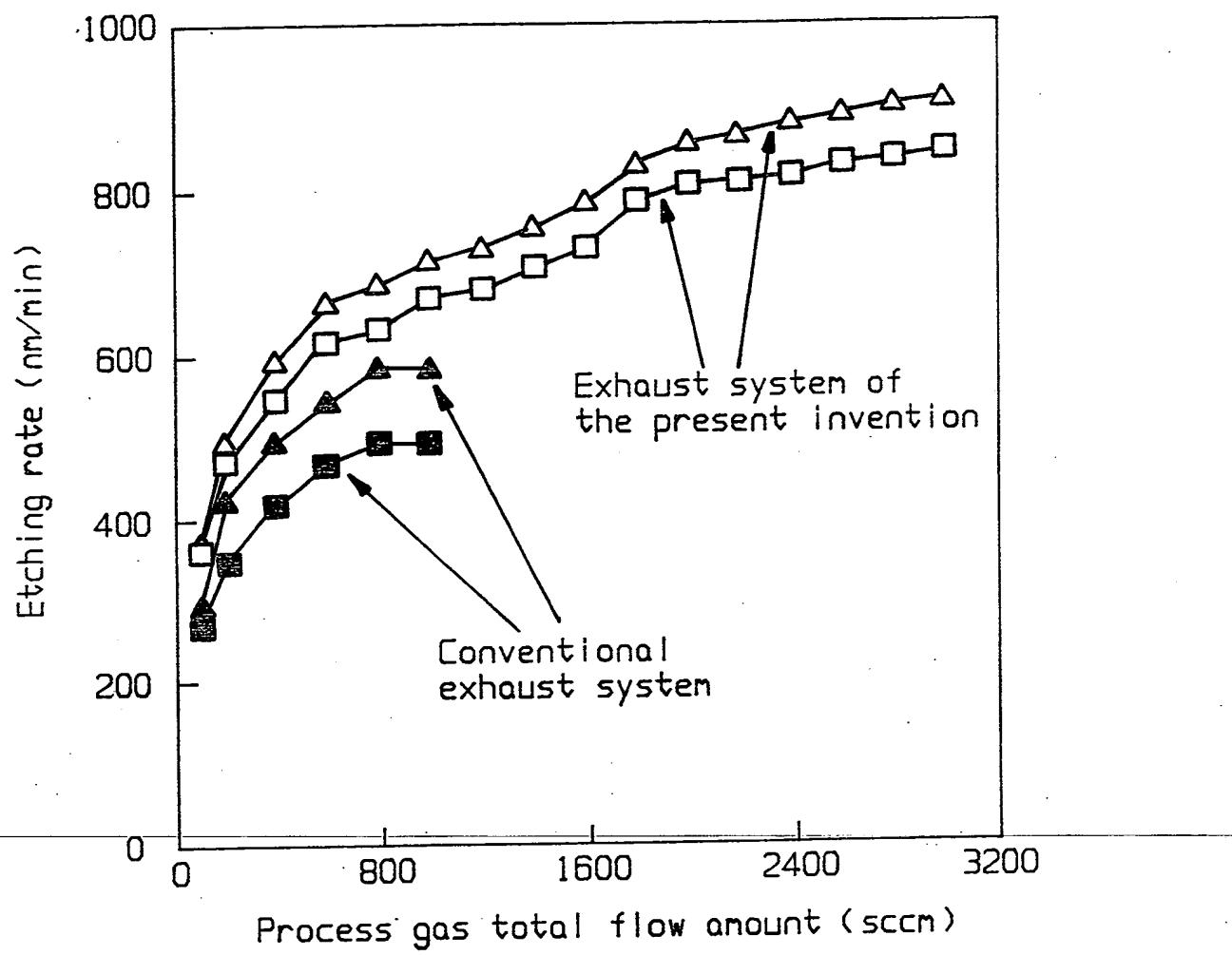


Fig. 57

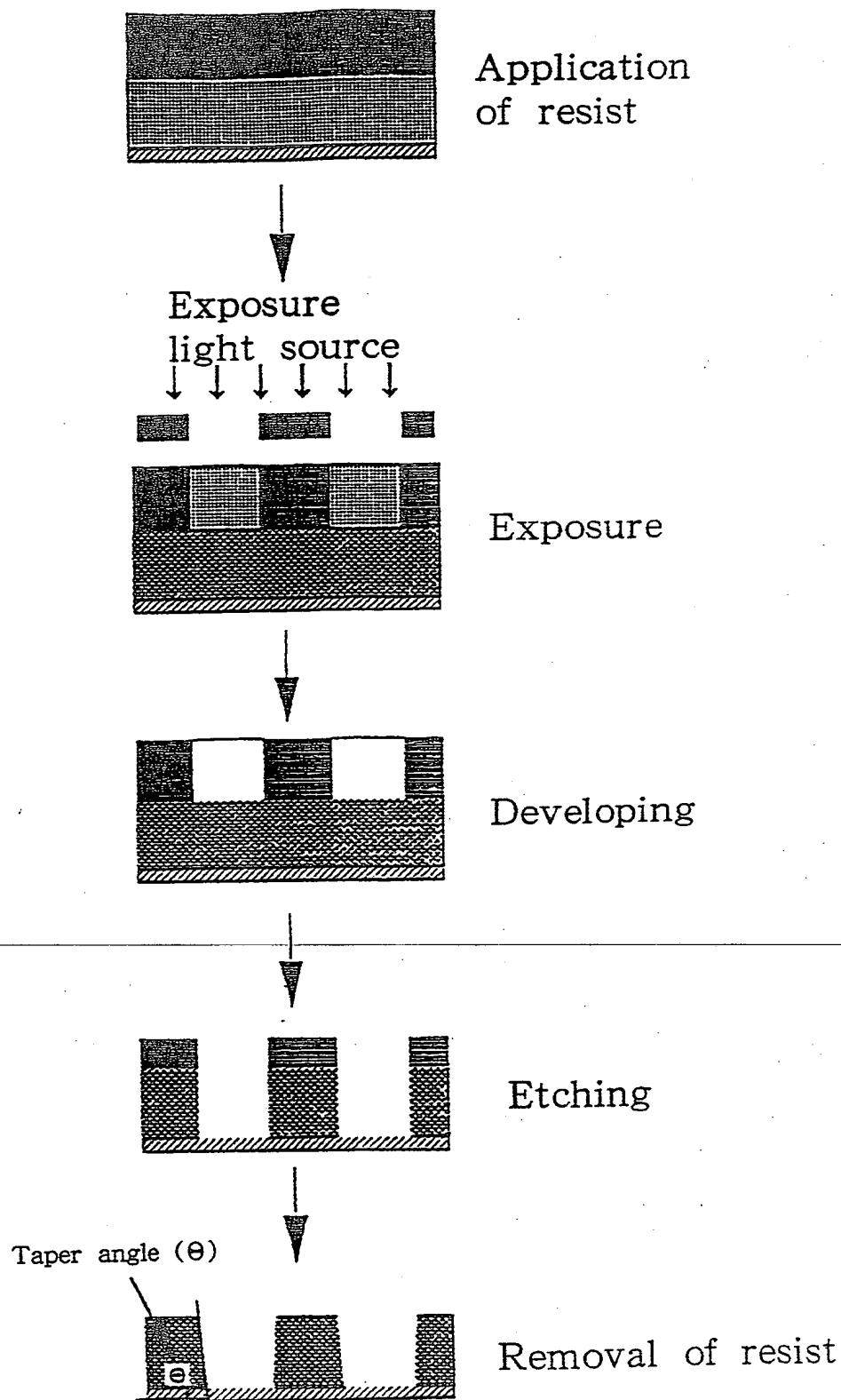


Fig. 58

Sputtering conditions : Pressure 10 (mTorr)
 Ar gas flow amount 1.5 (slm)

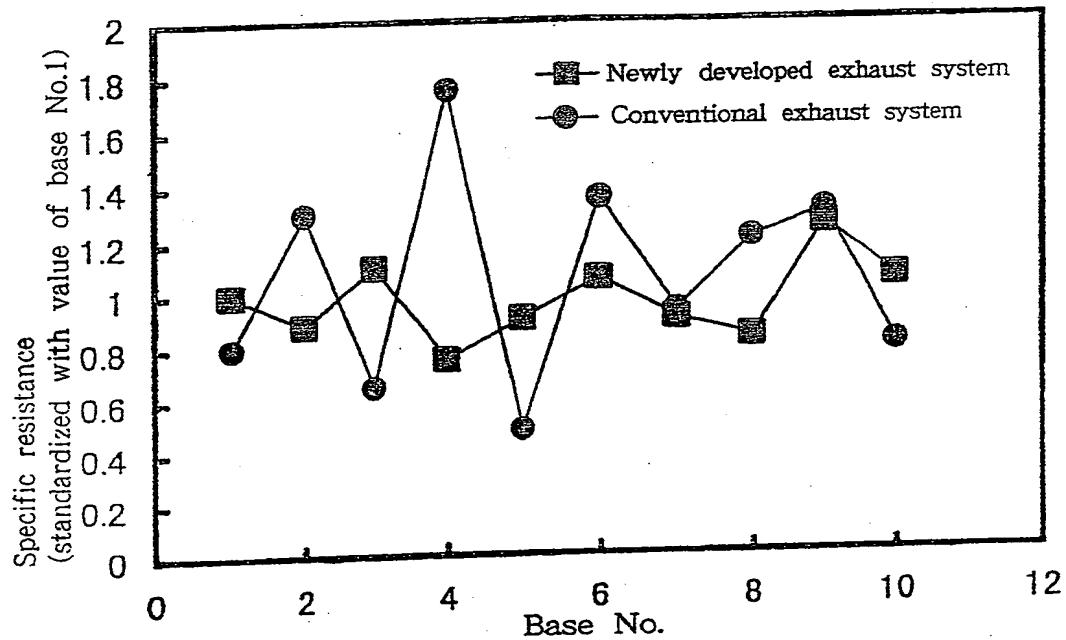


Fig. 59

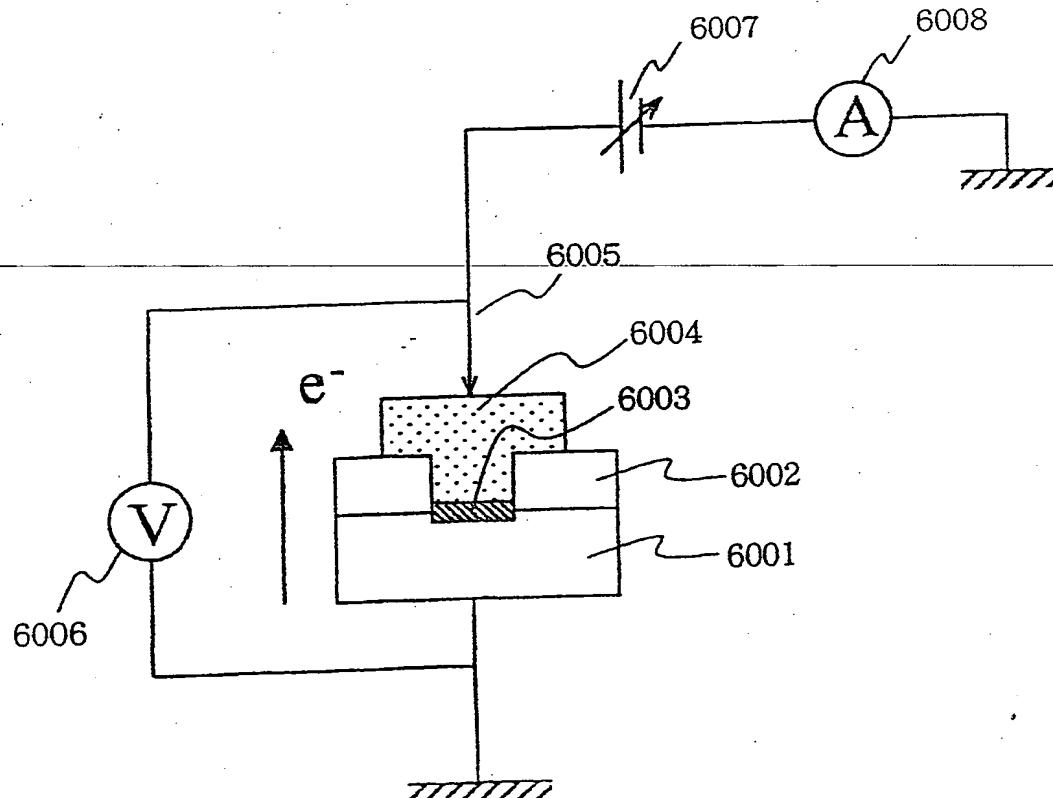


Fig. 60

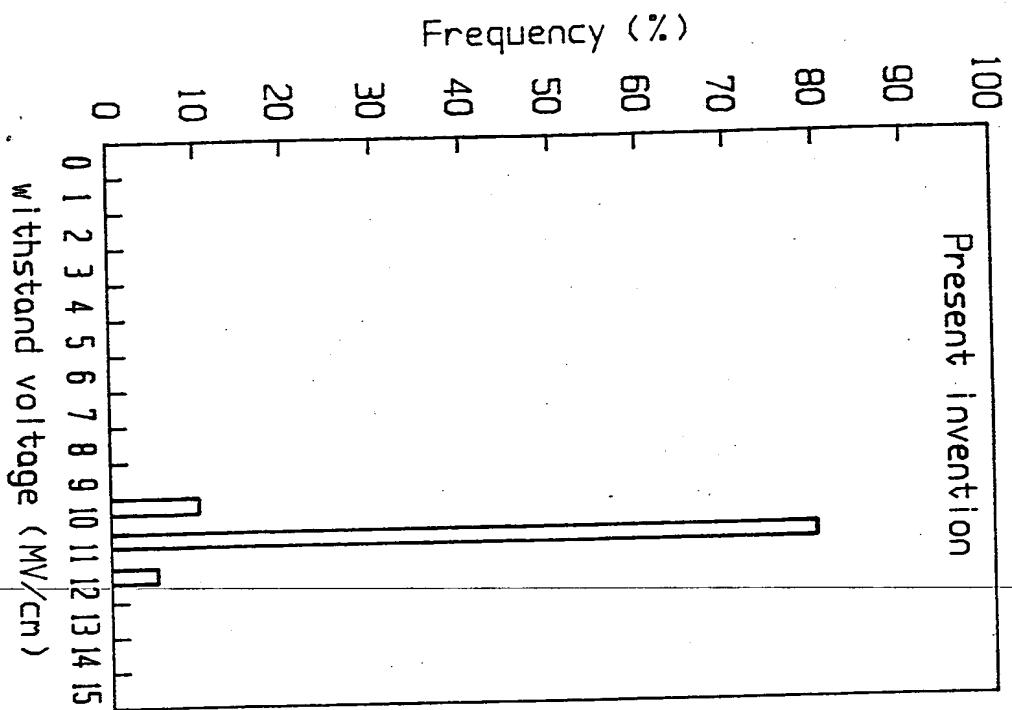


Fig. 61A

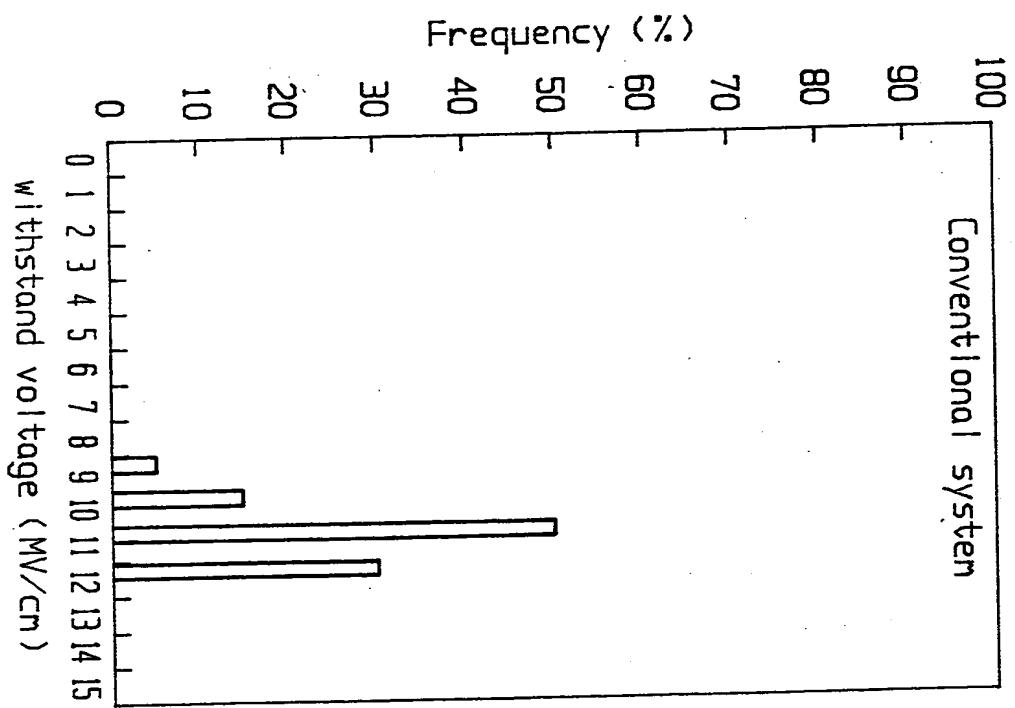


Fig. 61B

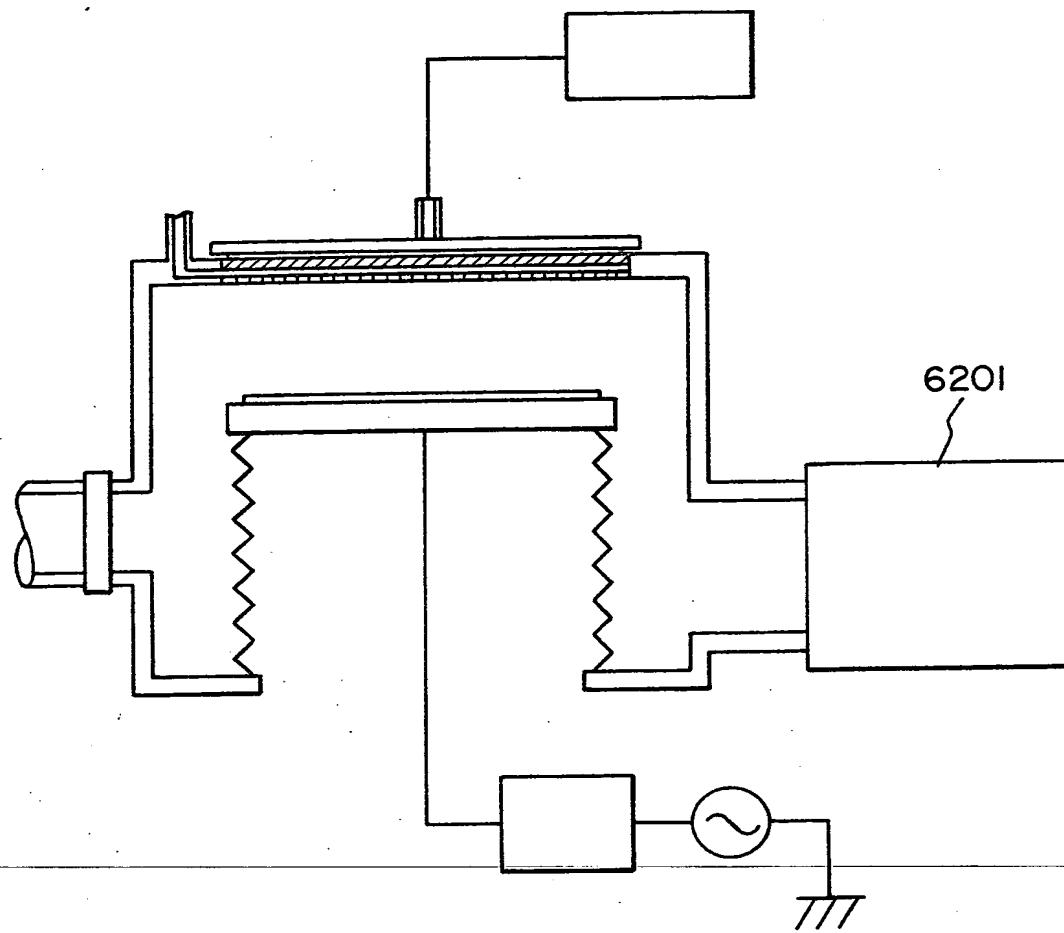


Fig. 62

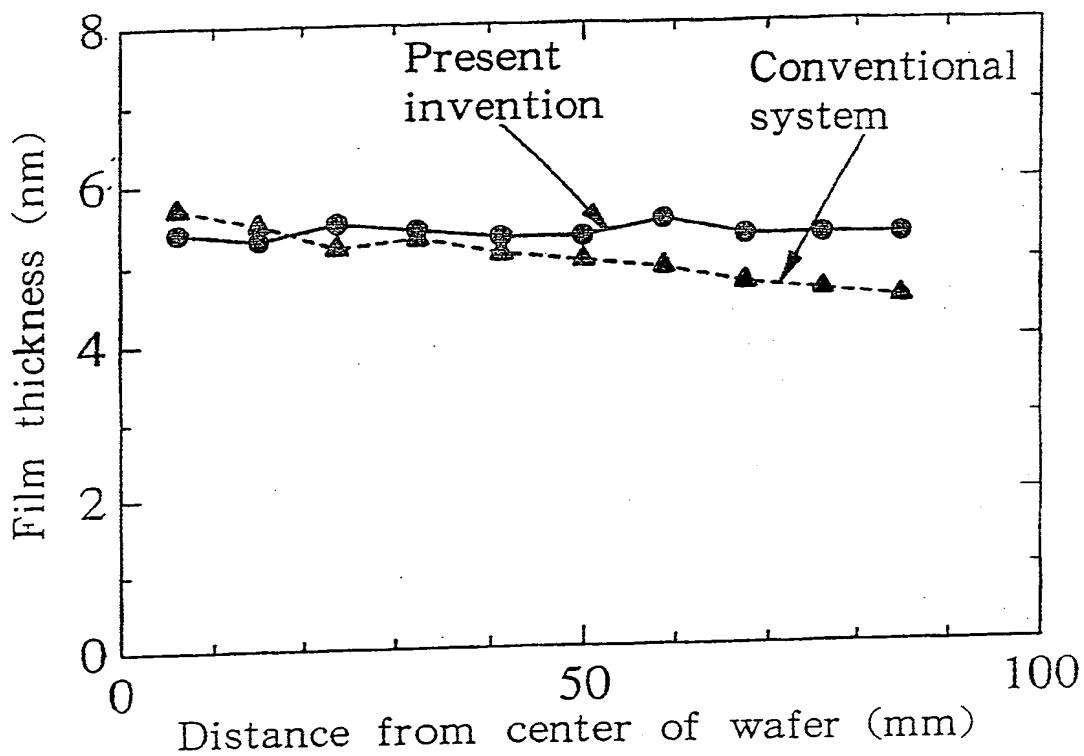


Fig. 63

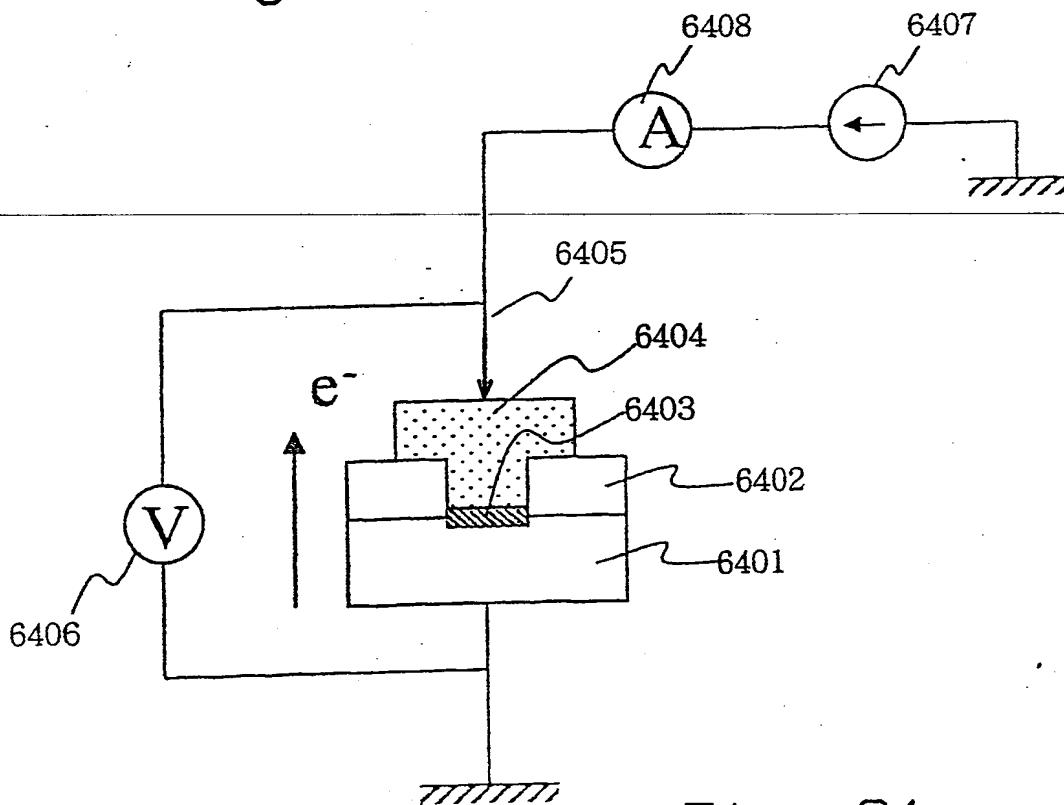


Fig. 64

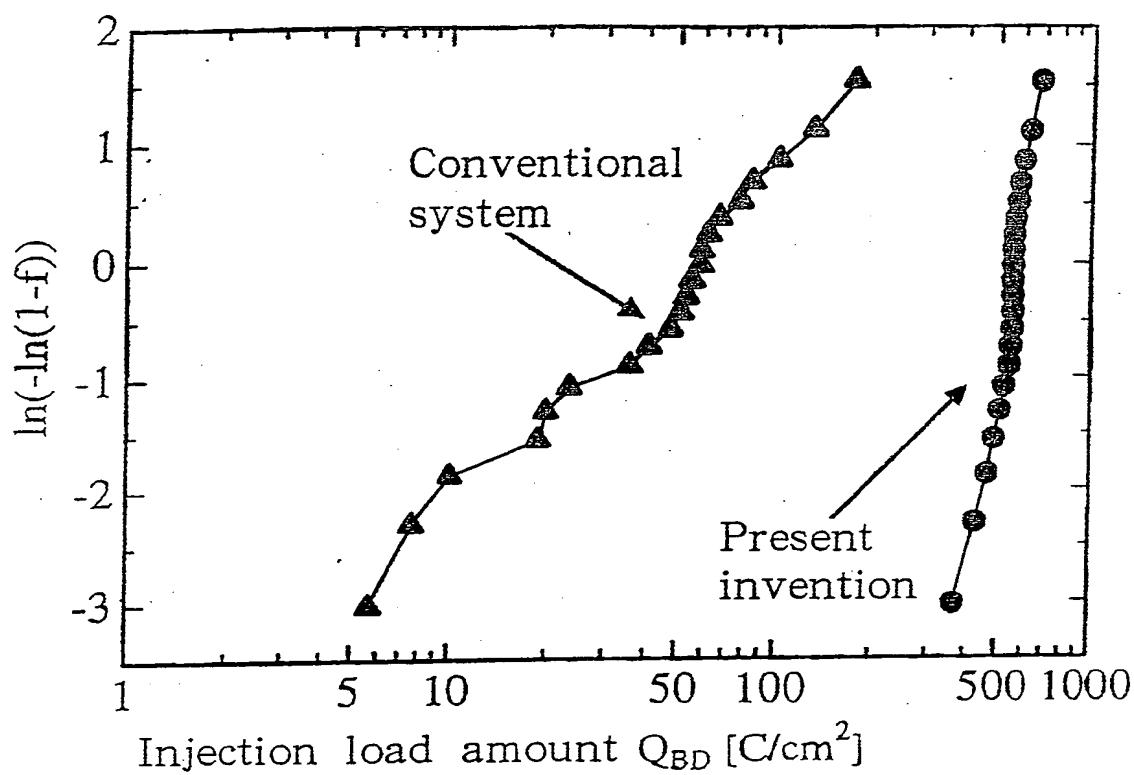


Fig. 65

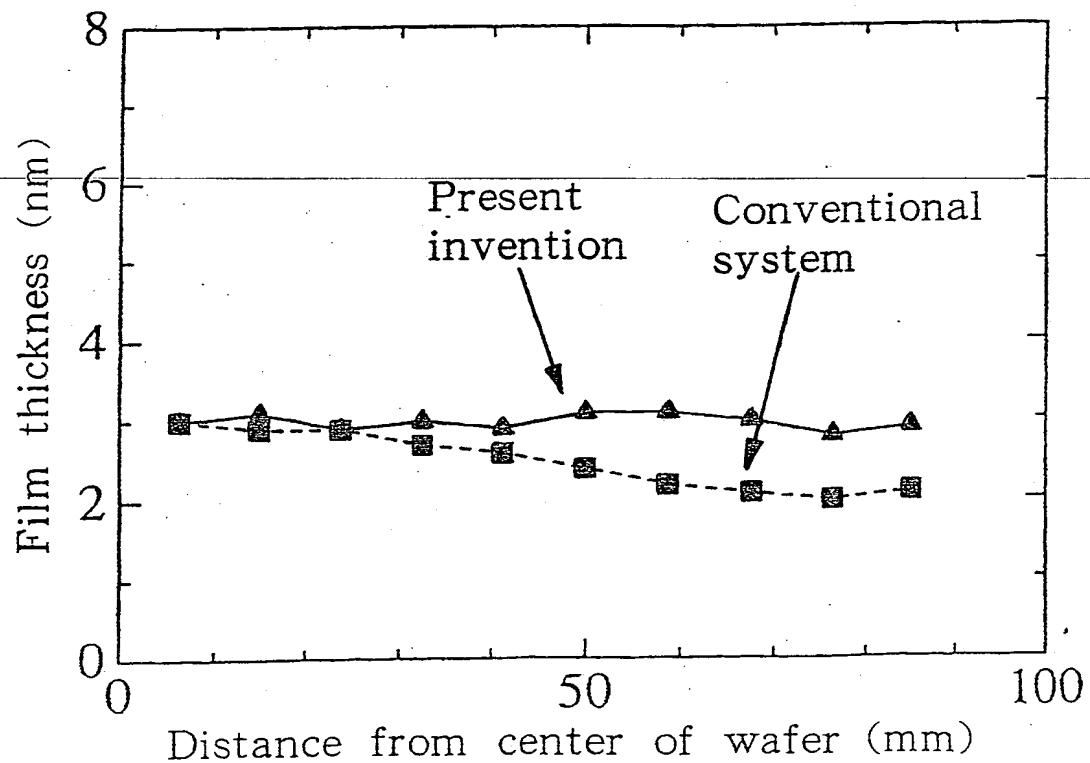


Fig. 66

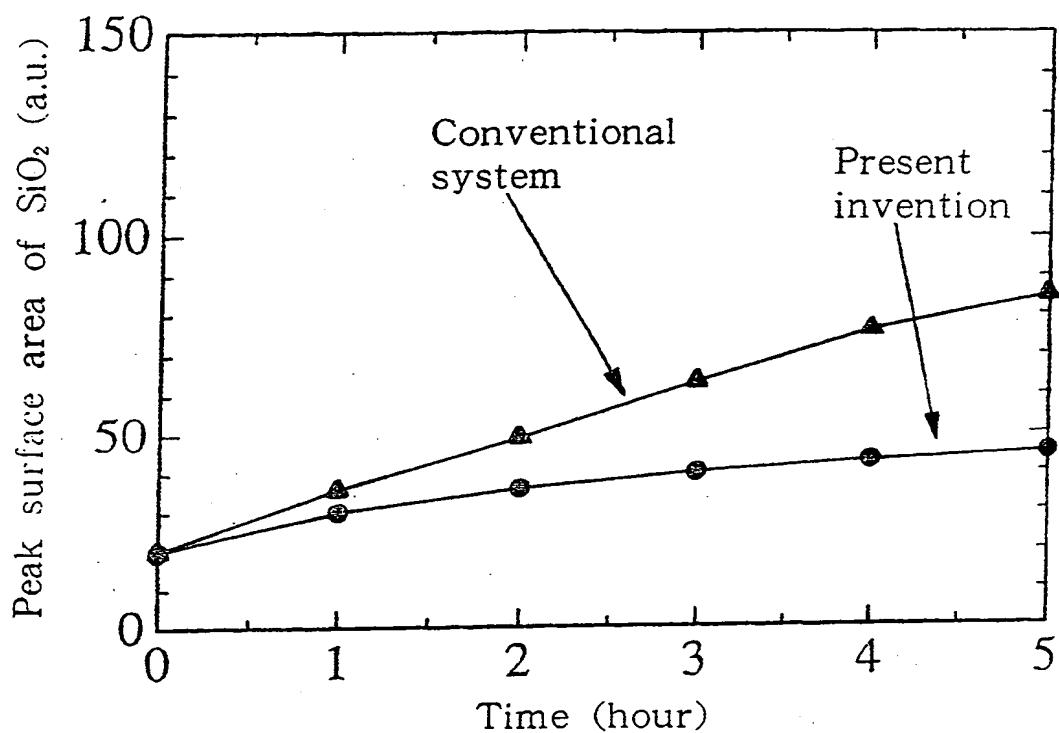


Fig. 67

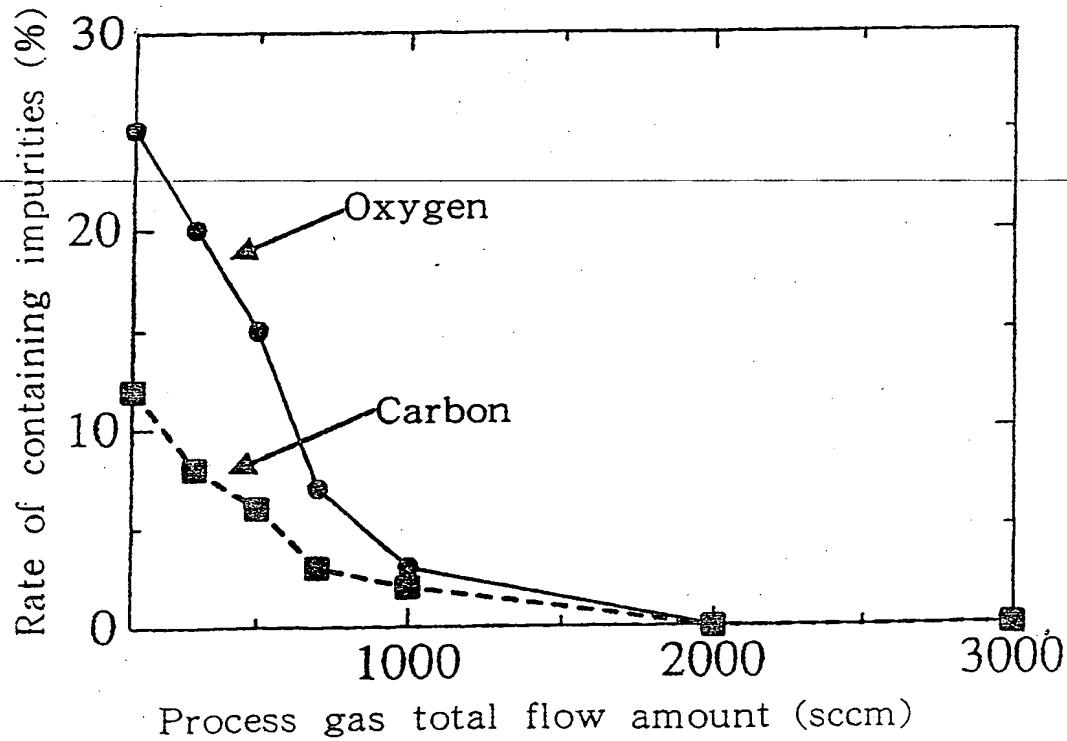
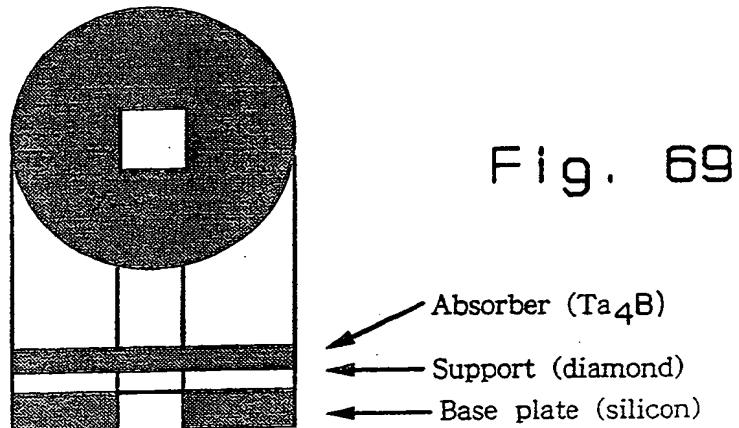


Fig. 68

Mask for X ray lithography



Permeability measurement system

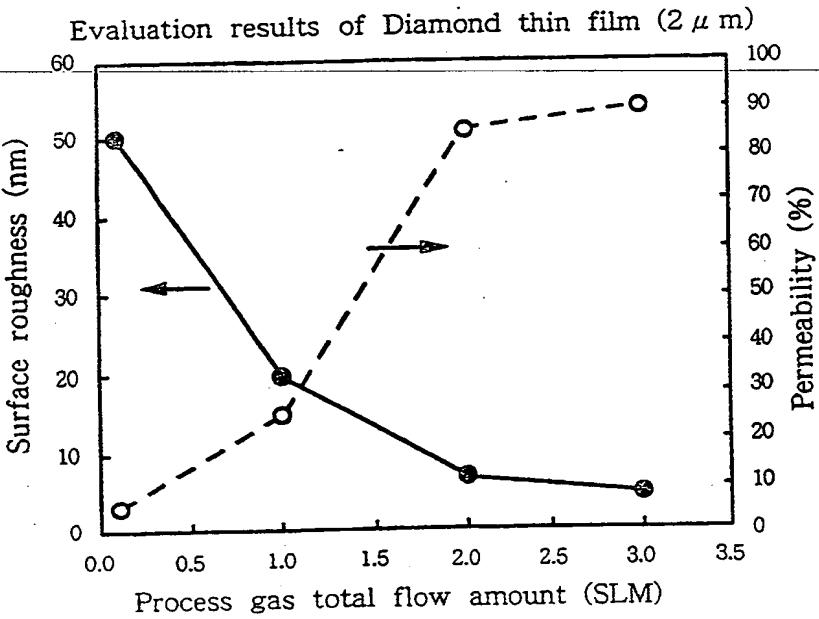
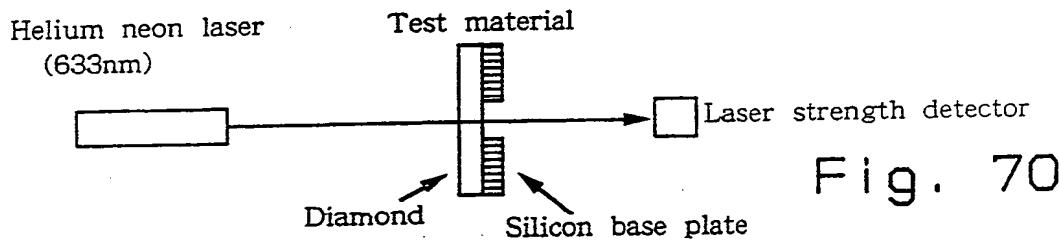


Fig. 71

Dependence of surface roughness
of a polycrystalline silicon thin film
on total flow amount

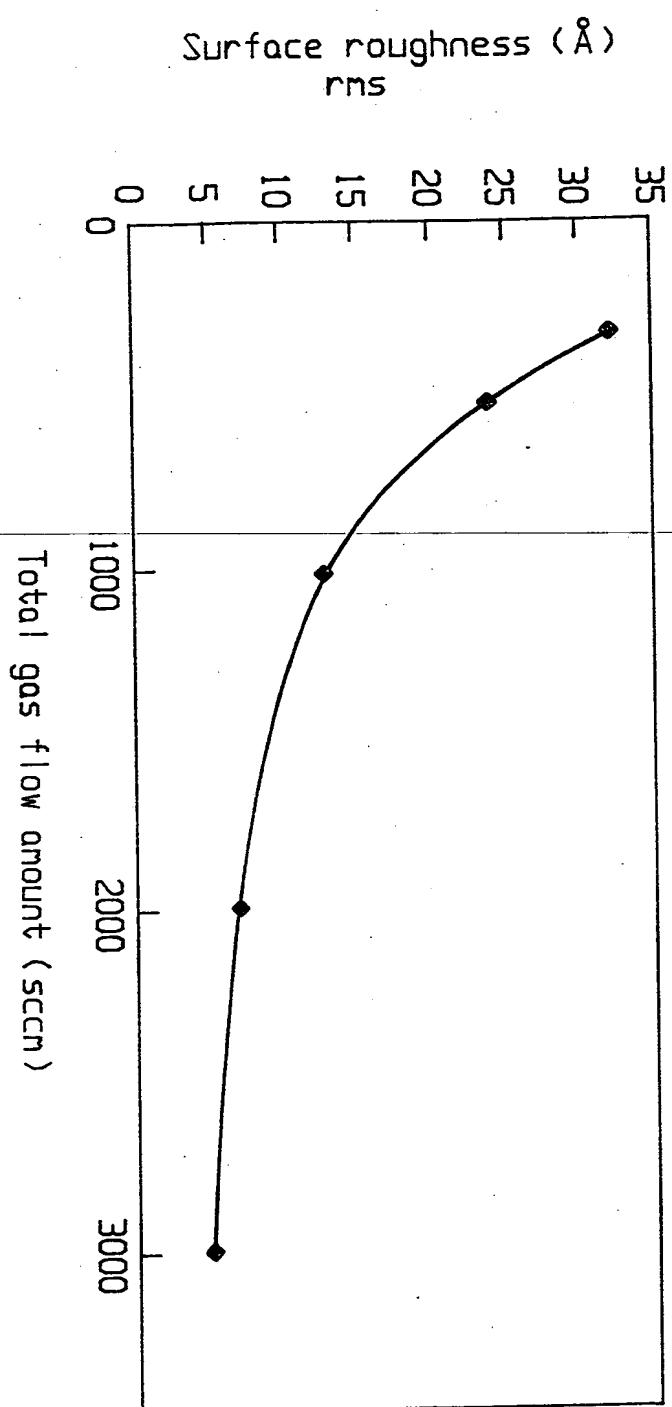


Fig. 72

Dependance of in-plane uniformity
of a glass substrate of a polycrystalline
silicon thin film on total gas flow amount

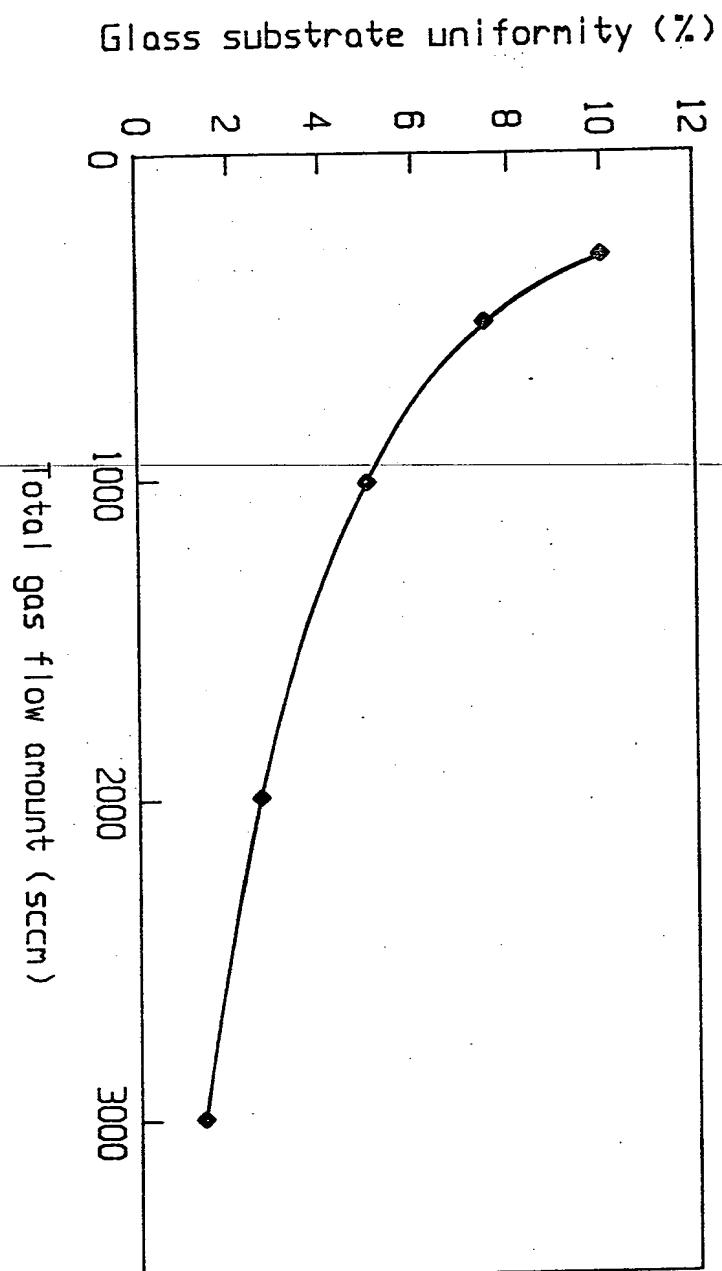


Fig. 73

Dependance of crystalline size
of polycrystalline silicon
on total gas flow amount

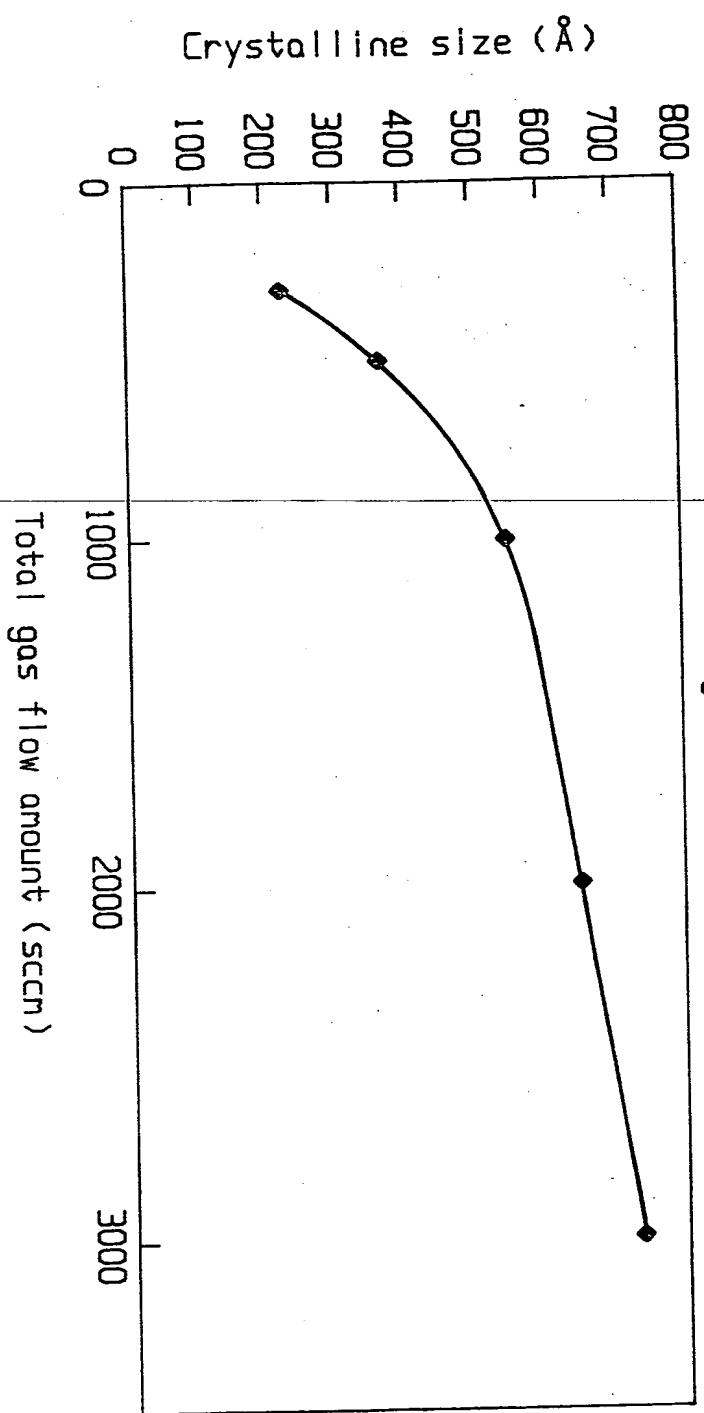


Fig. 74

Dependance of amount of hydrogen
in a polycrystalline silicon film
on the total gas flow amount

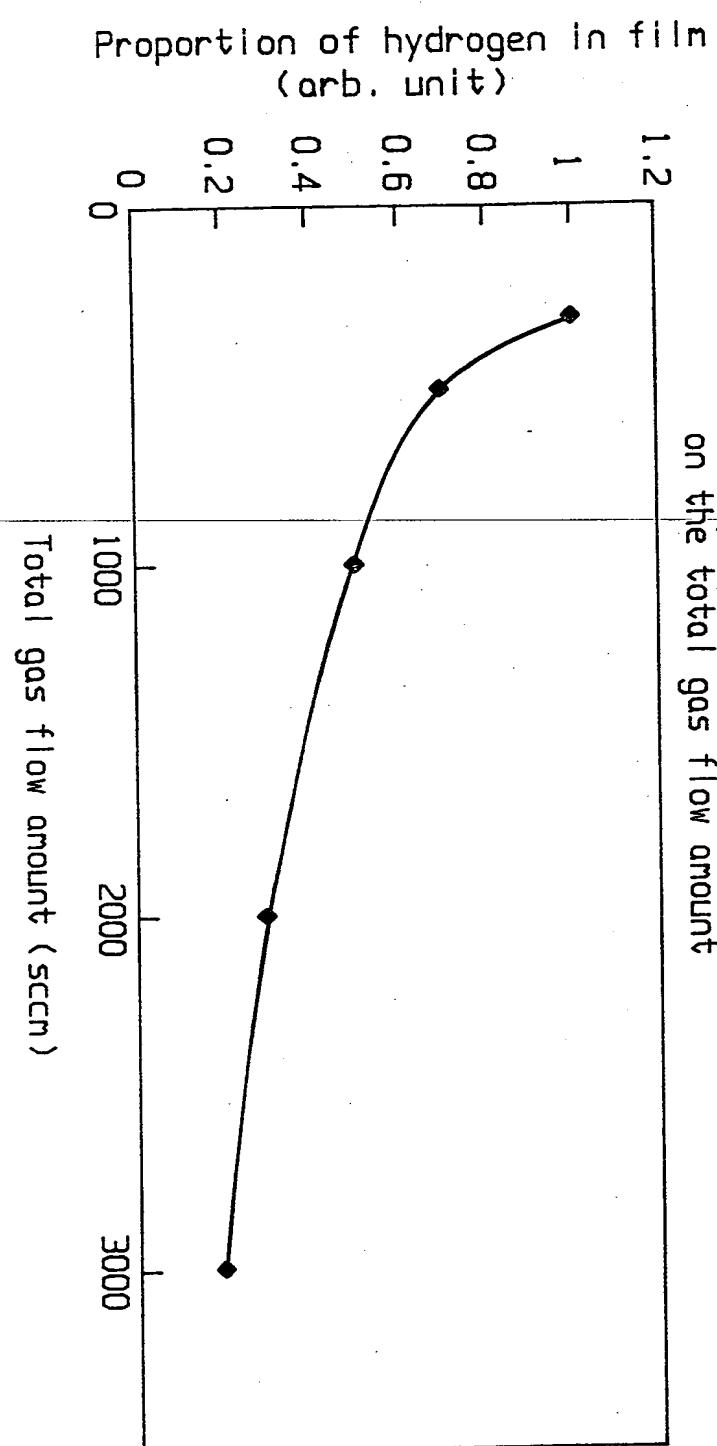


Fig. 75

Dependance of specific resistance
of polycrystalline silicon (P dopant)
on the total gas flow amount

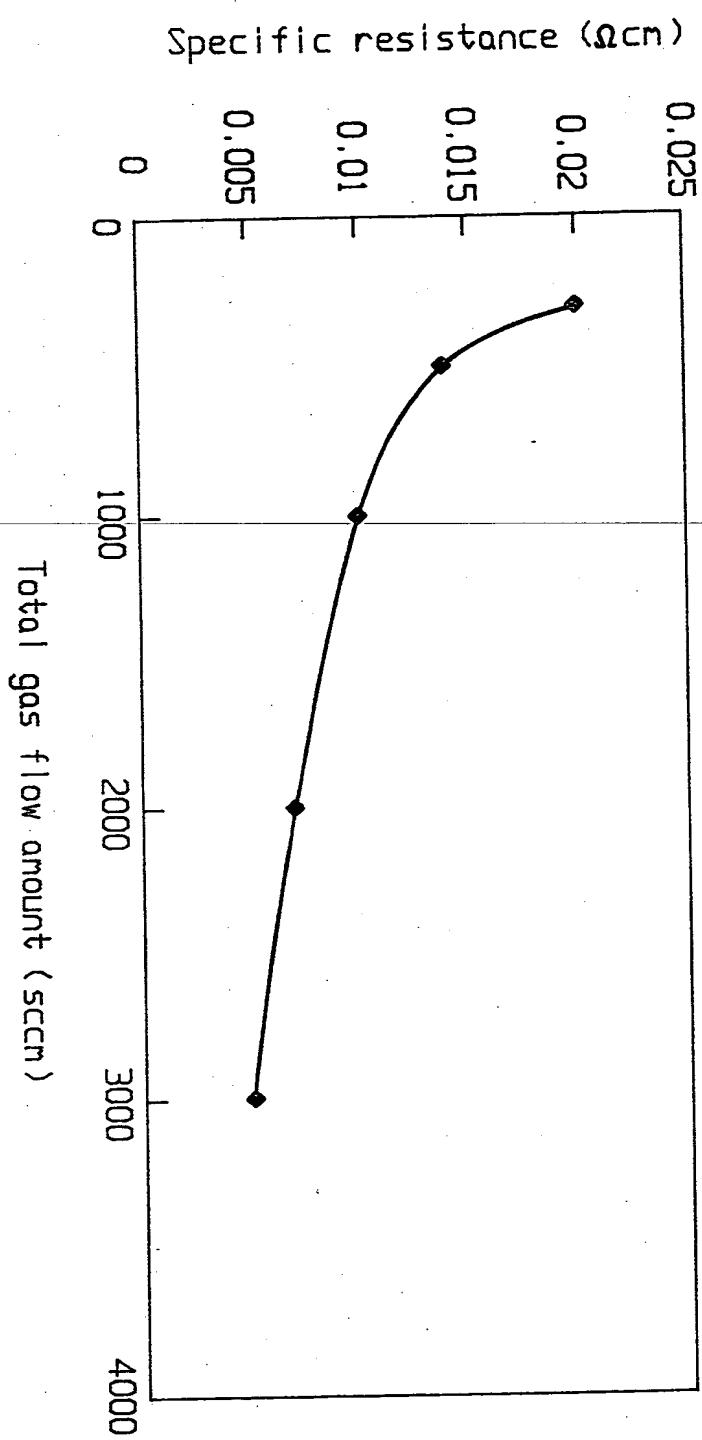


Fig. 76

Dependence of in-plane uniformity
of a SiN_x film on the total flow amount

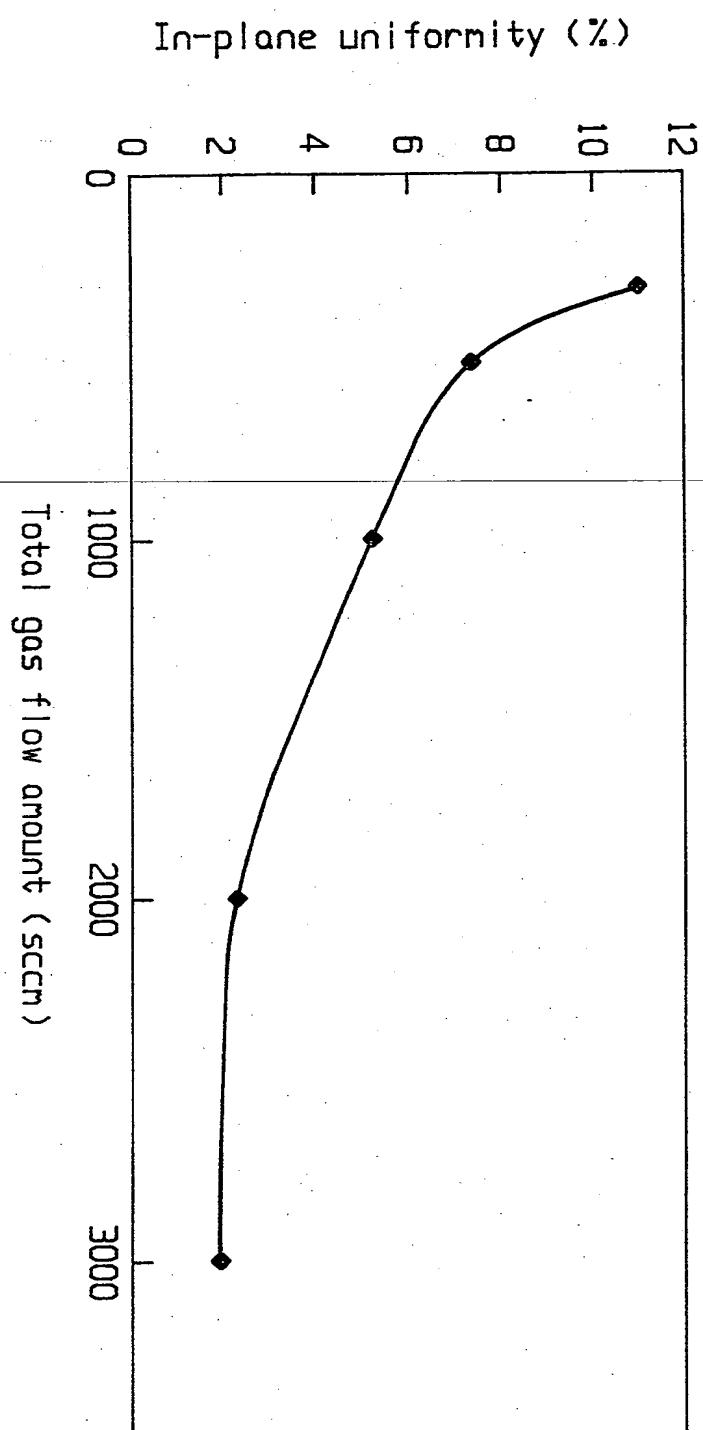


Fig. 77

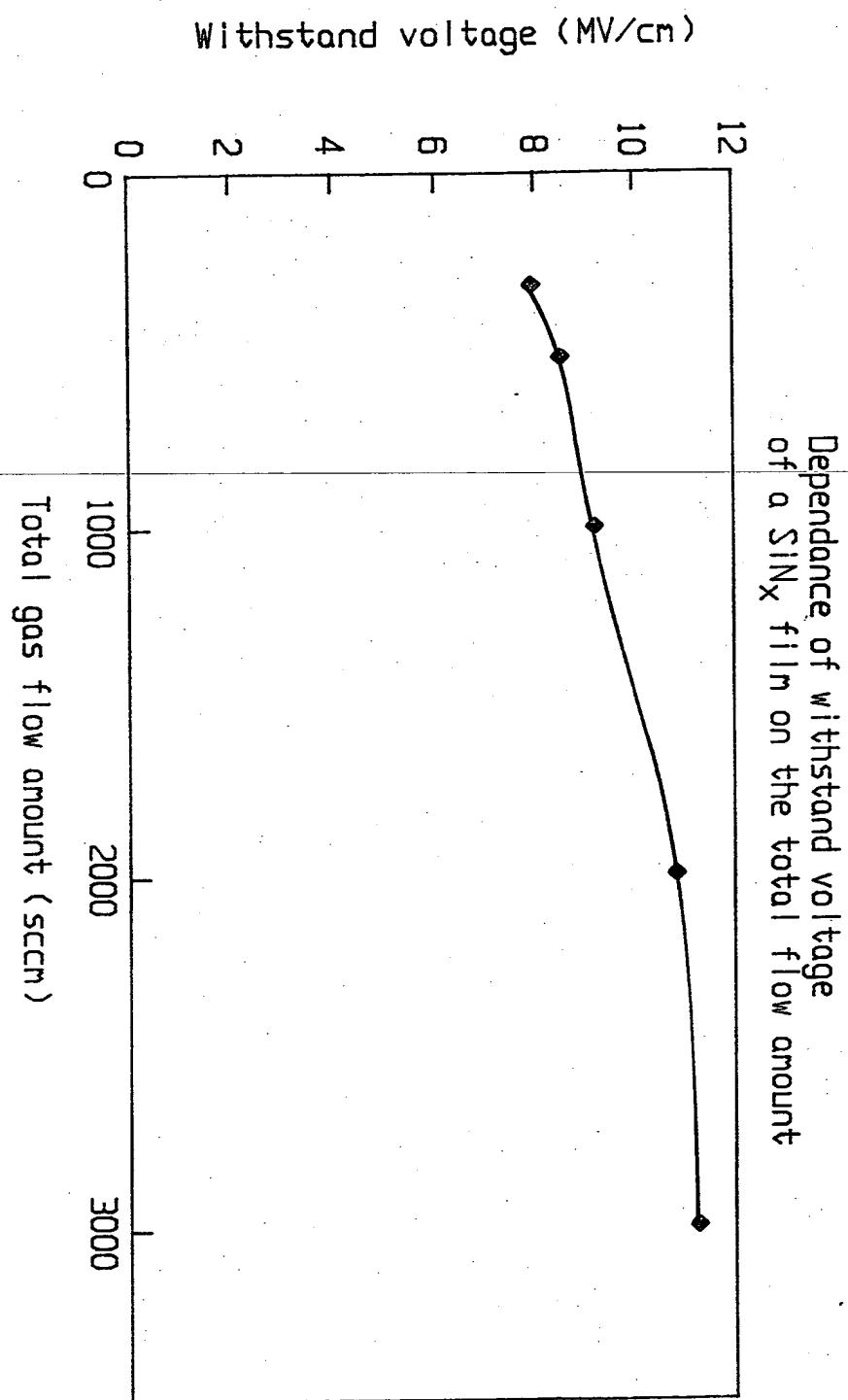


Fig. 78

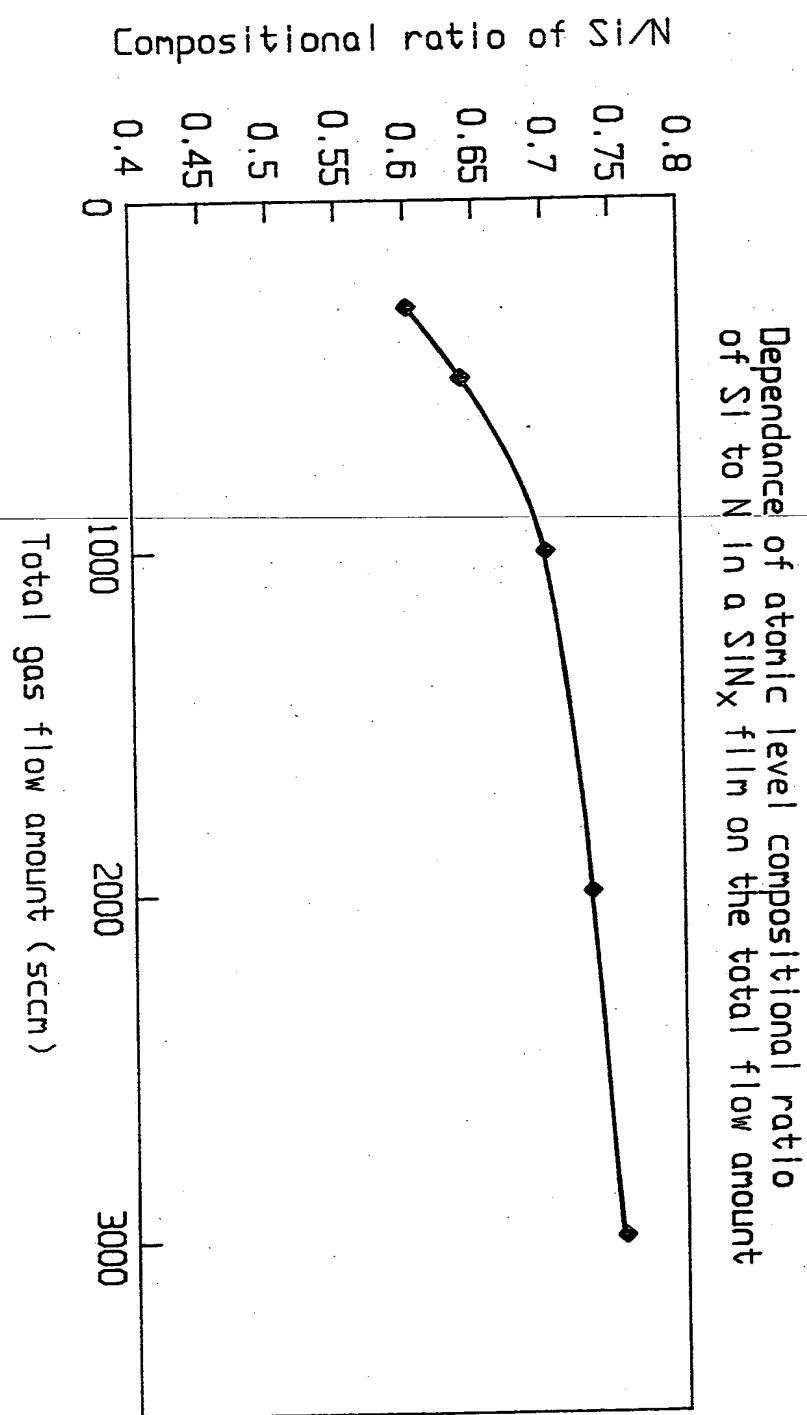


Fig. 79

Dependence of the deposition rate
of a fluorocarbon film on total gas
flow amount

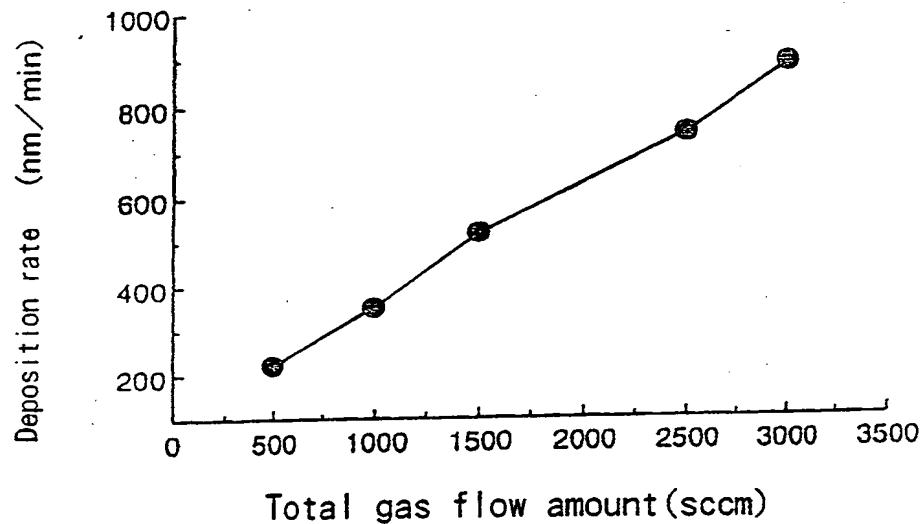


Fig. 80

Dependence of in-plane uniformity
of the deposition rate of a fluorocarbon film
on total gas flow amount on wafer

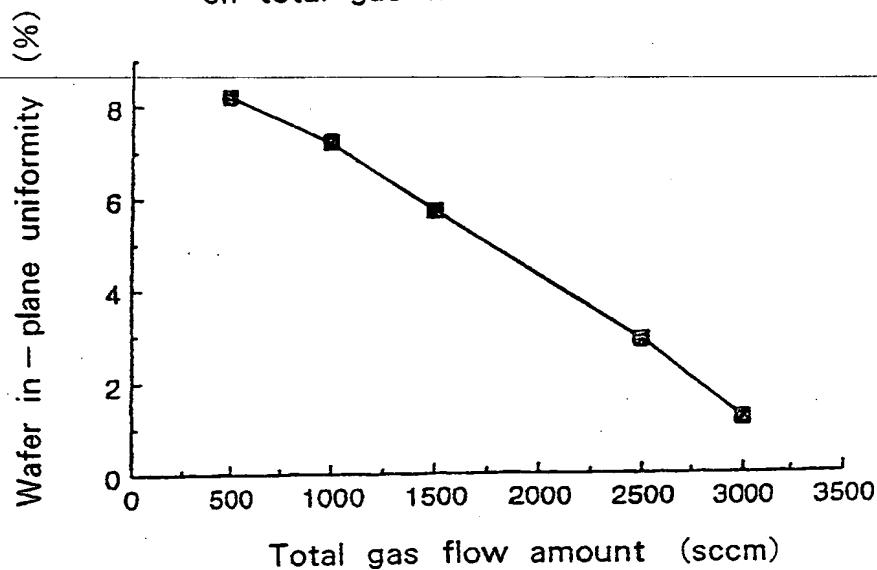


Fig. 81

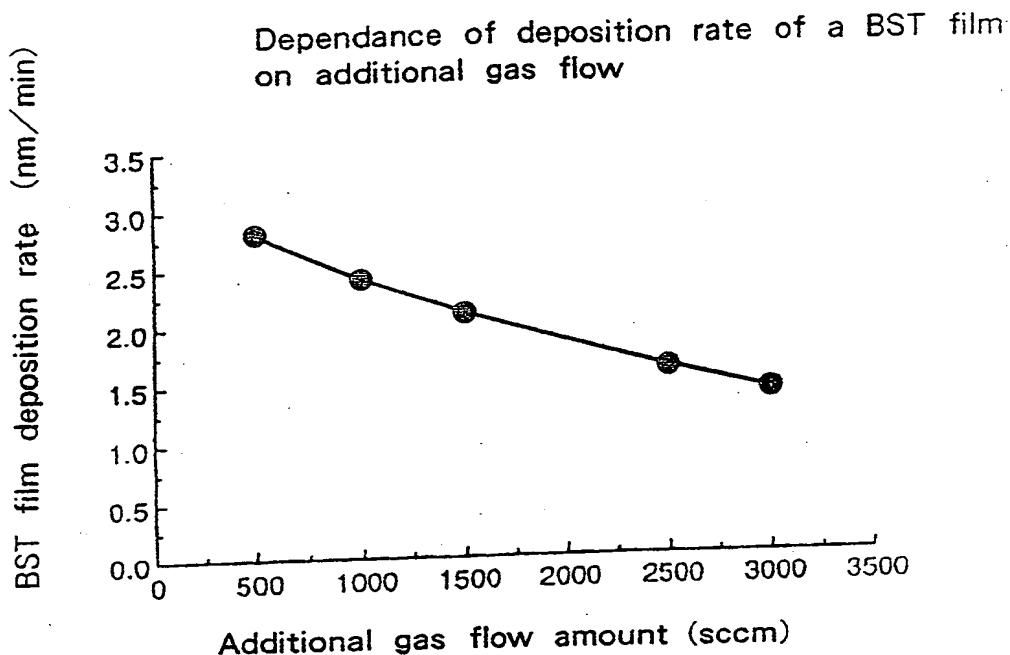


Fig. 82

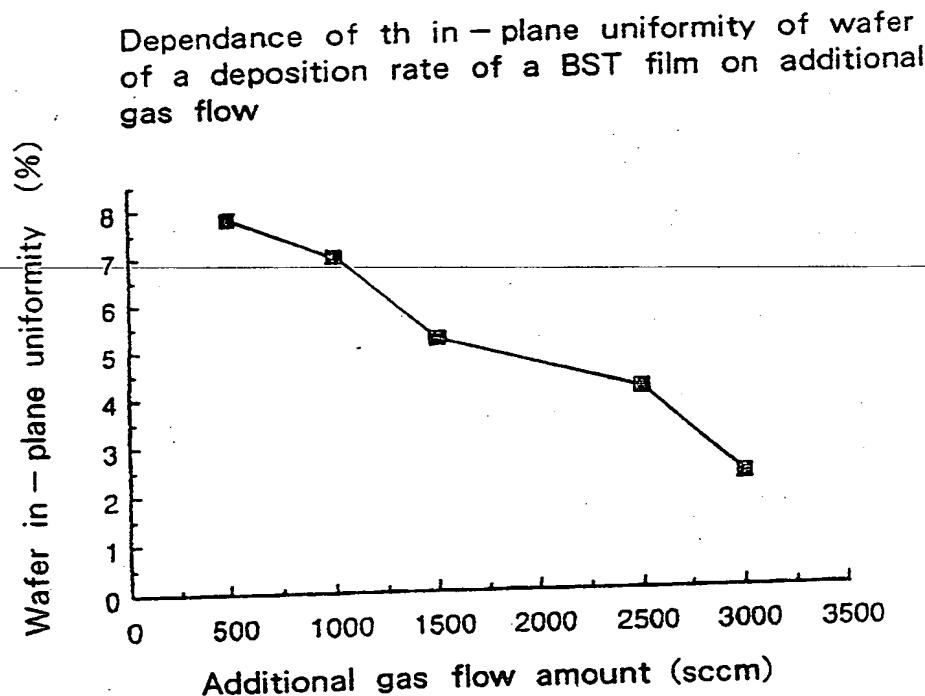


Fig. 83

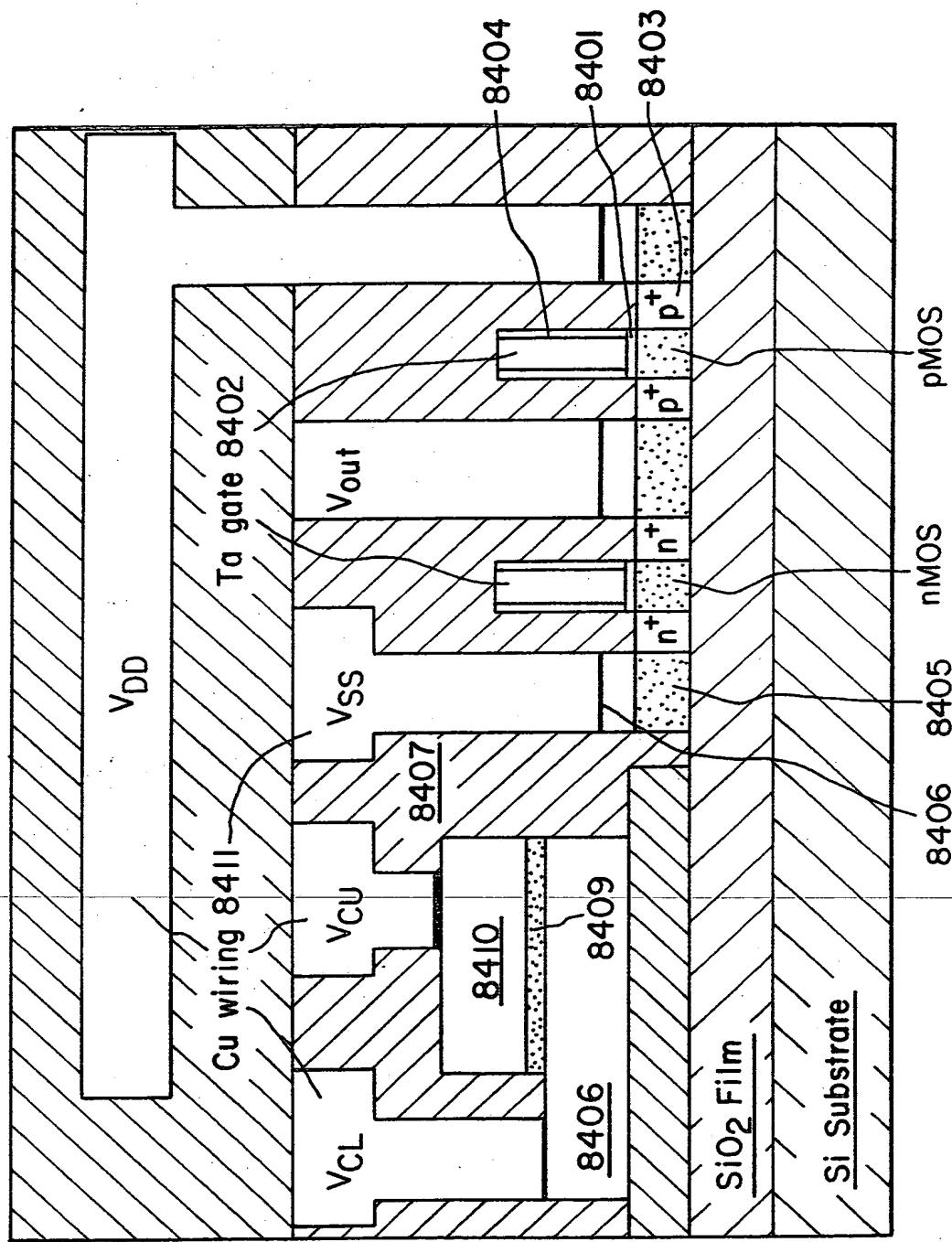


Fig. 84

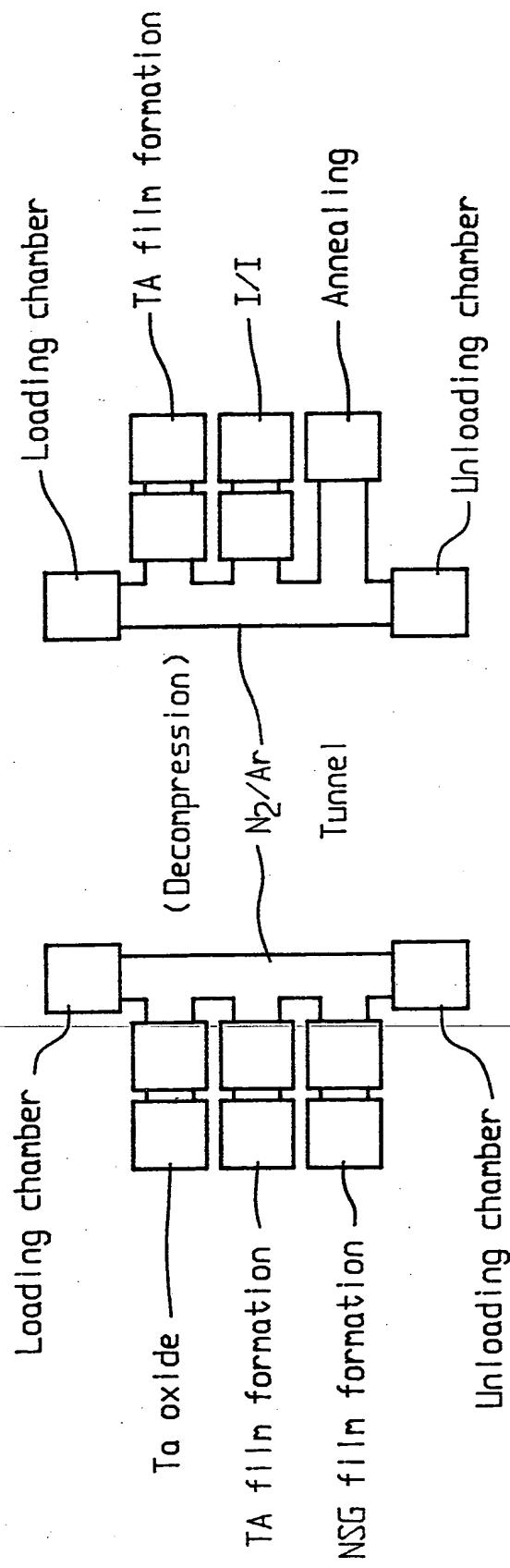
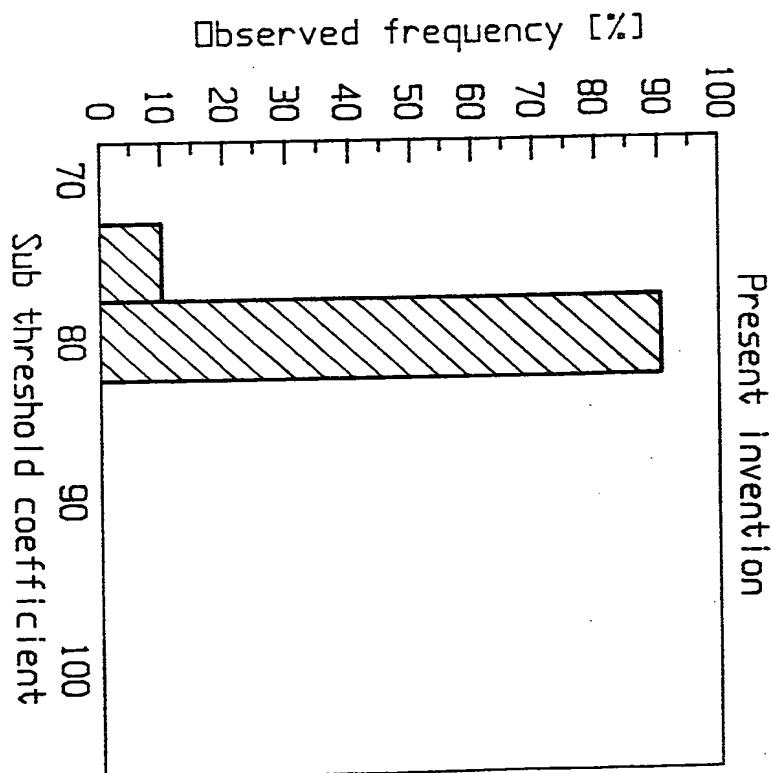
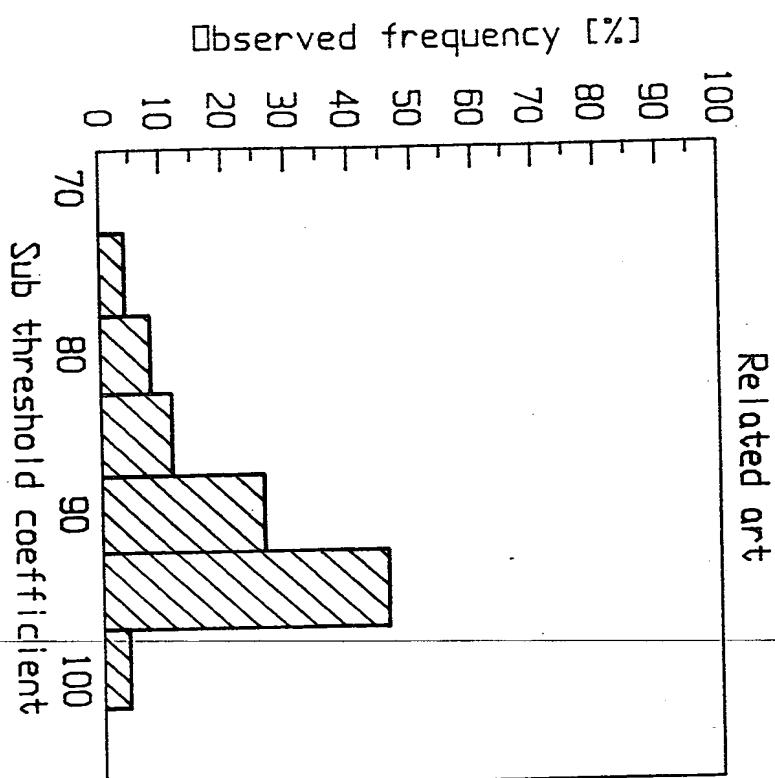


Fig. 85A

Fig. 85B



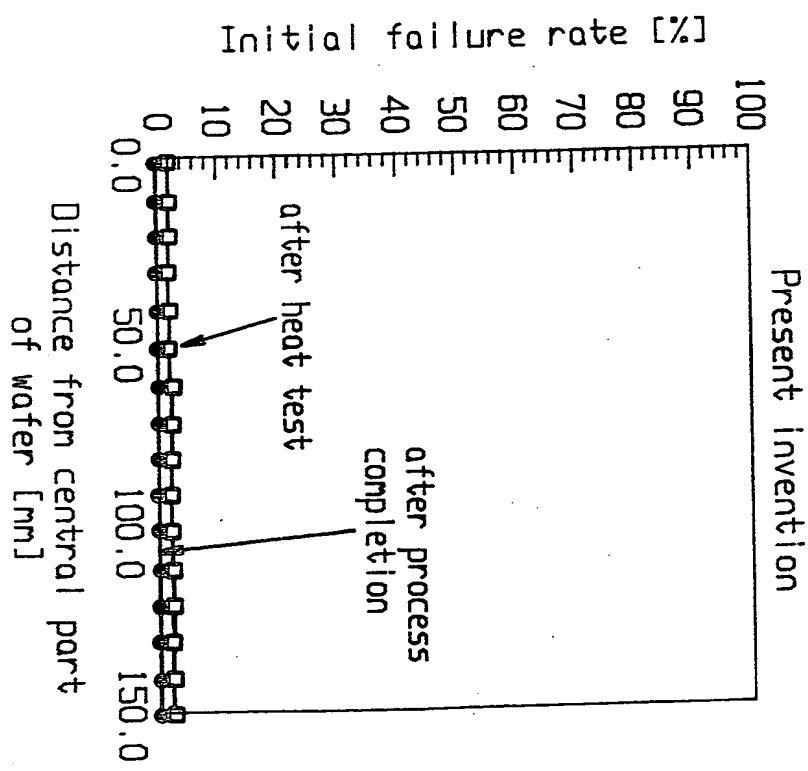
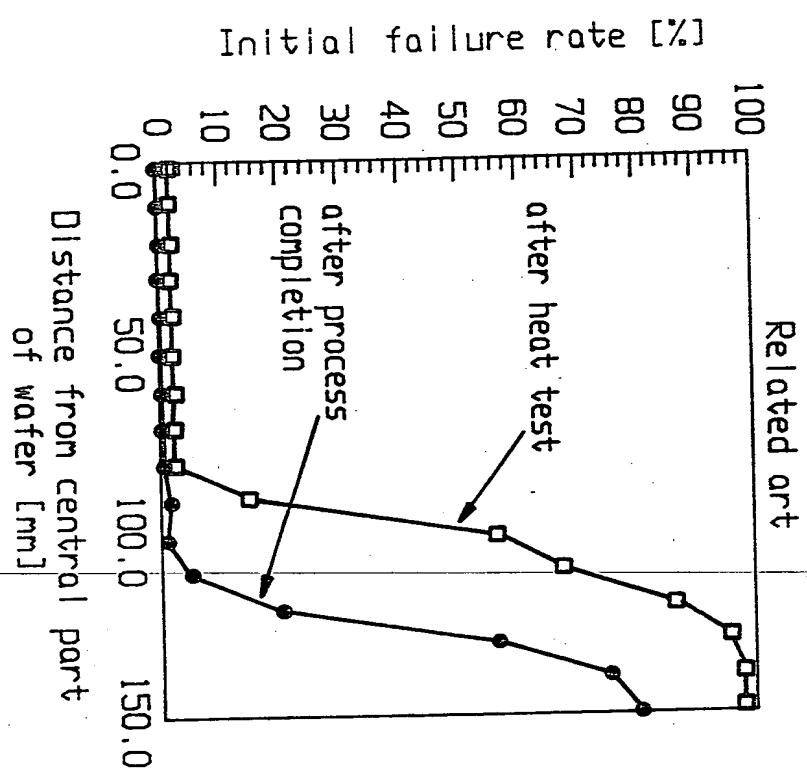


Fig. 87A

Fig. 87B

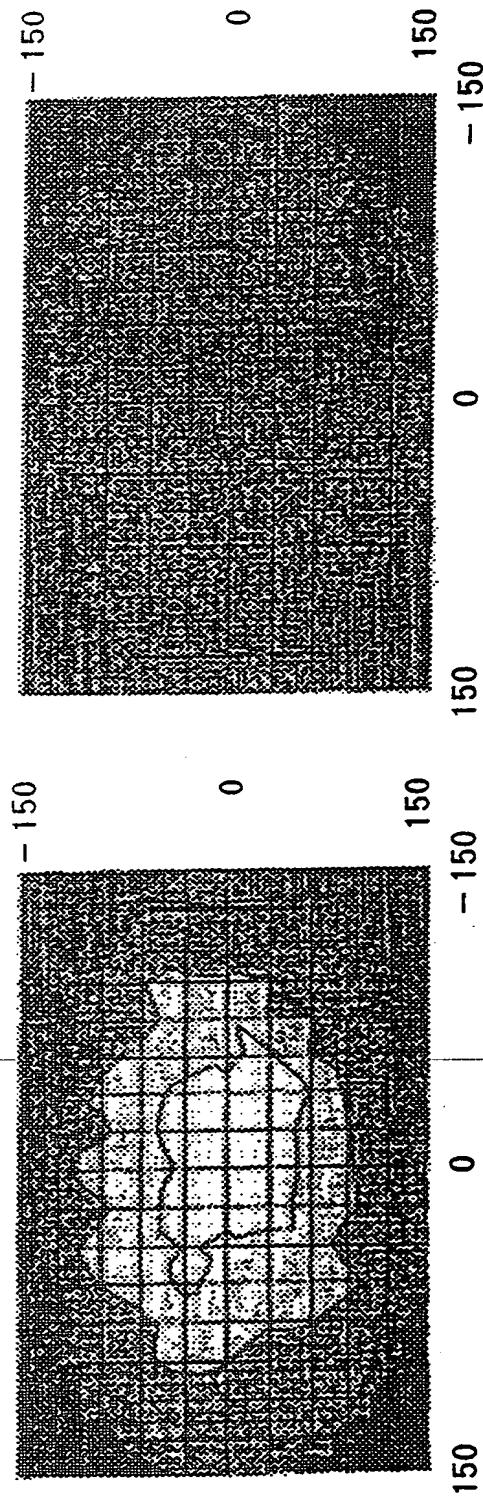
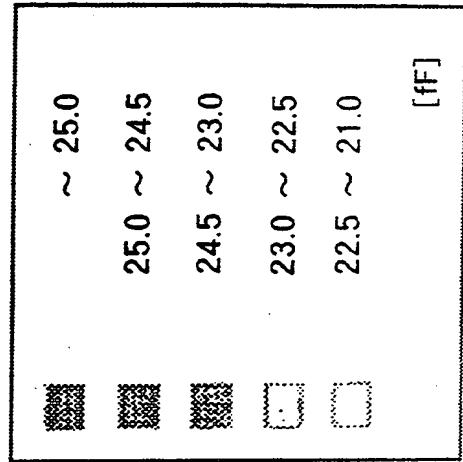
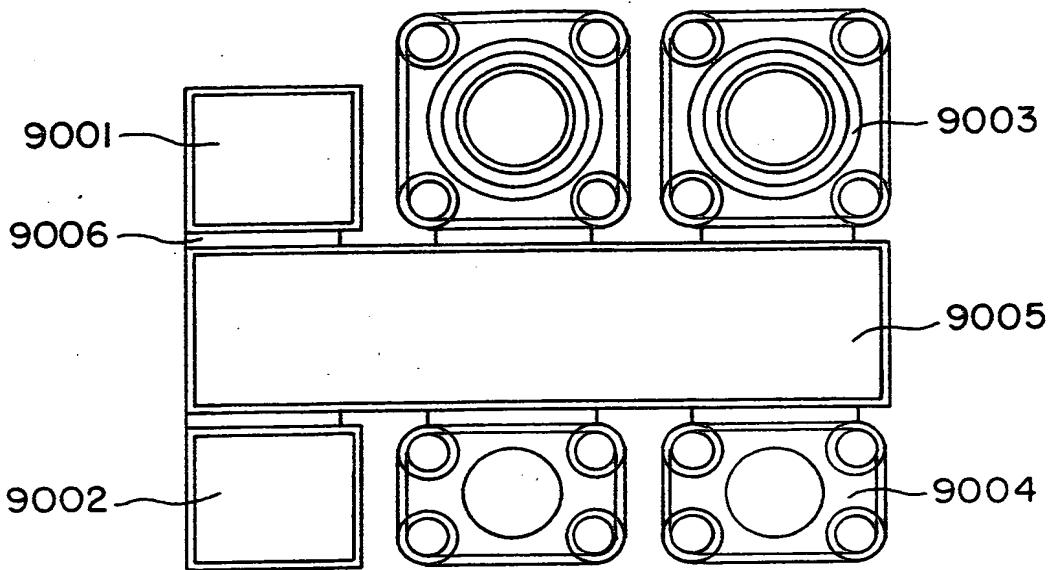


Fig. 88A Related art

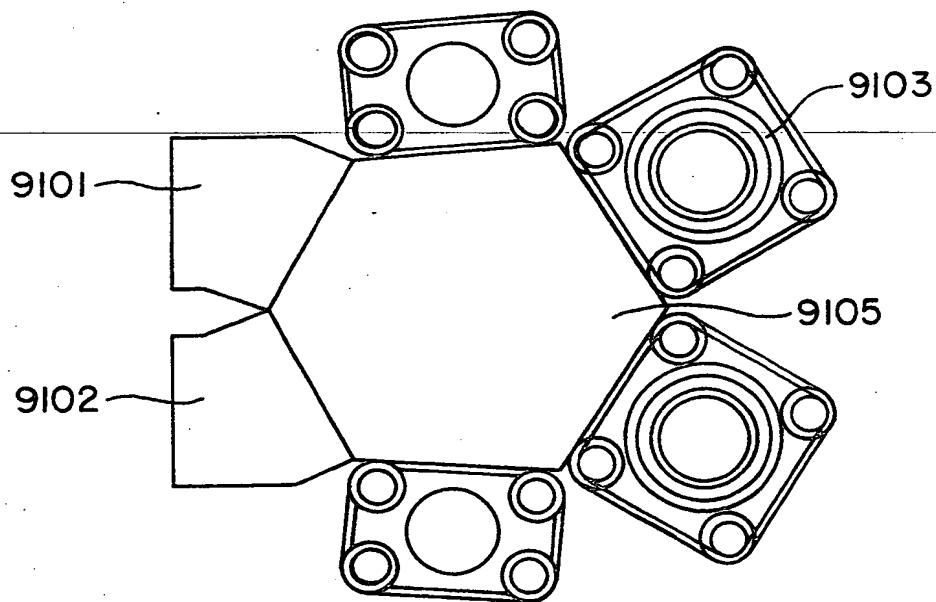
Fig. 88B Present invention





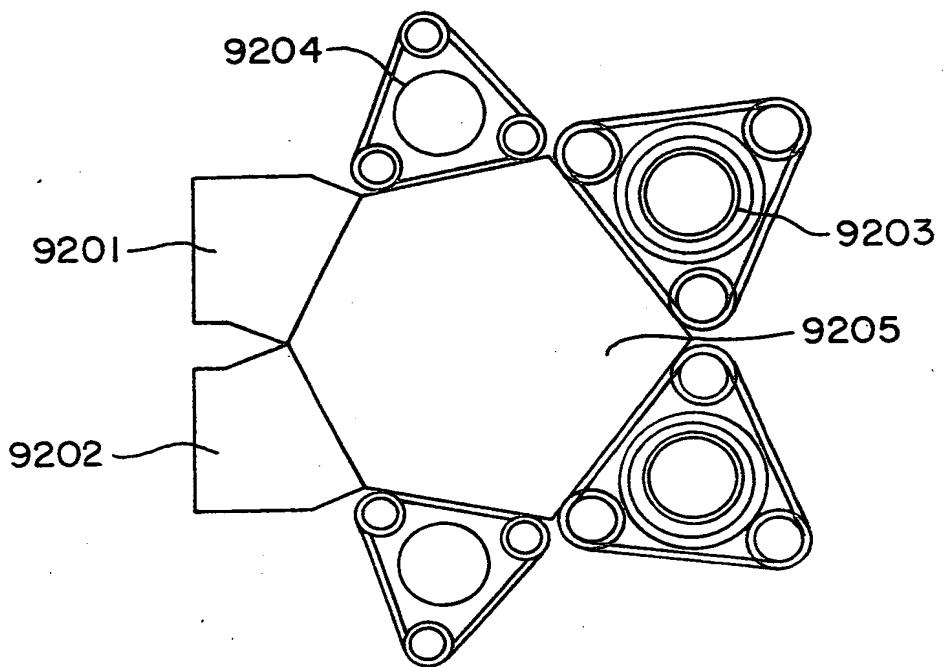
Cluster tool comprising assembly of rectangular process chamber (1)

Fig. 90



Cluster tool comprising assembly of rectangular process chamber (2)

Fig. 91



Cluster tool comprising assembly of triangular process chamber

Fig. 92

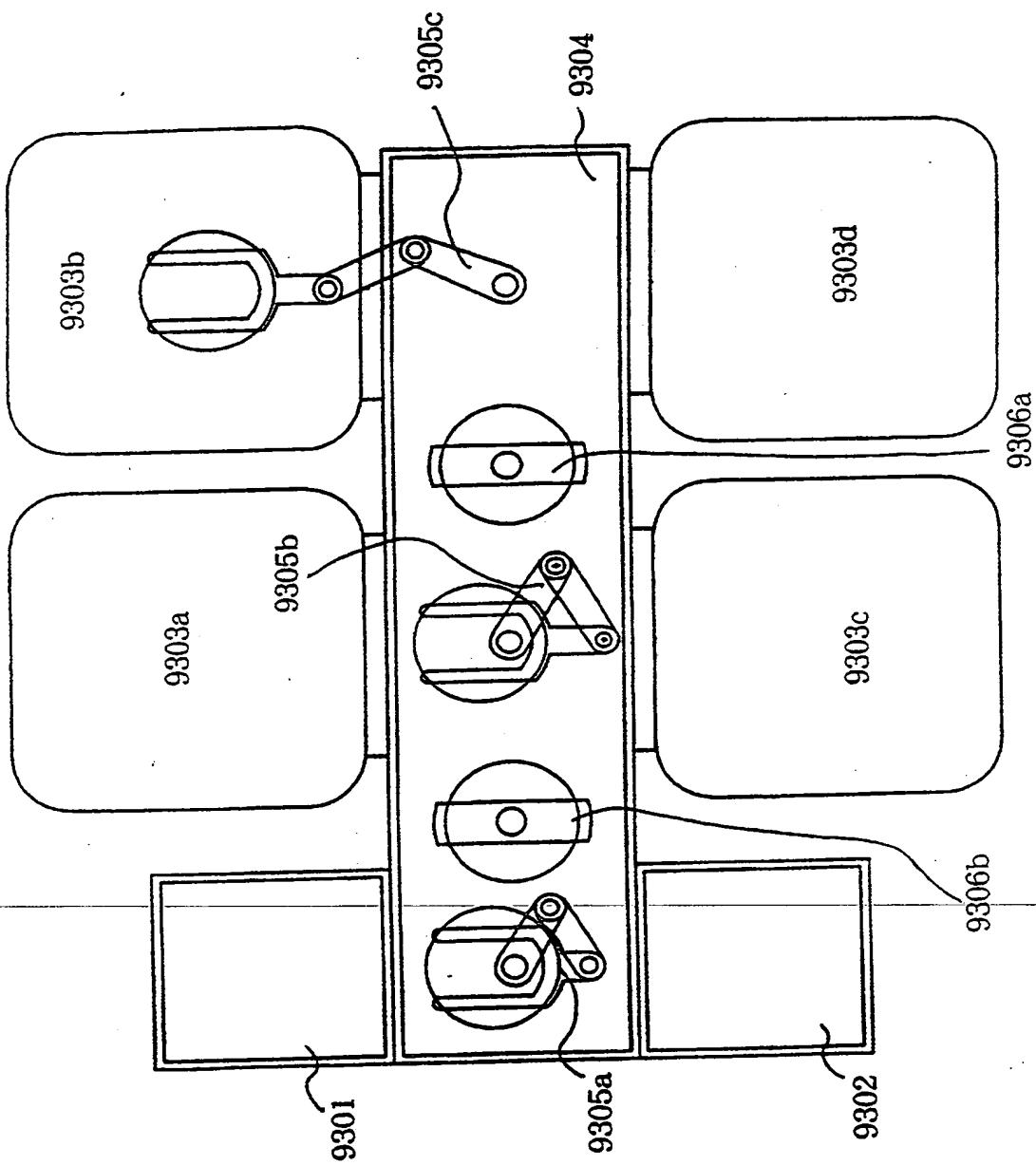


Fig. 93

Fig. 95

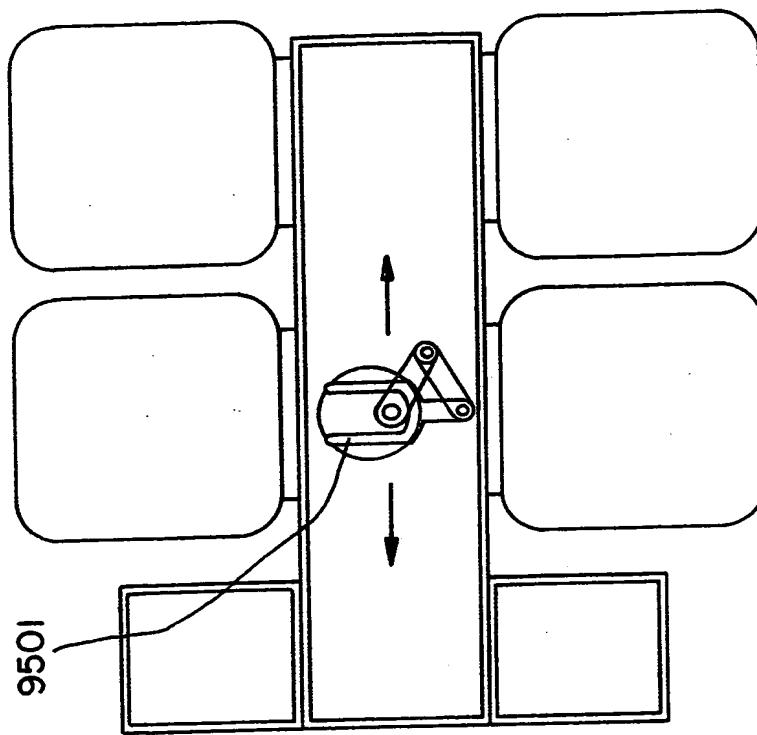


Fig. 94

